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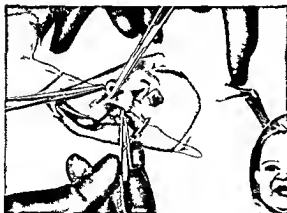
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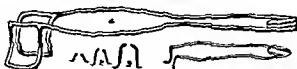
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SURGERY

GYNECOLOGY AND OBSTETRICS

An International Magazine, Published Monthly

VOLUME 81

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NUMBER 1

PRIMARY RESECTION (CLOSED ANASTOMOSIS) OF RECTAL AMPULLA FOR MALIGNANCY WITH PRESERVATION OF SPHINCTERIC FUNCTION

Together with a Further Account of Primary Resection of the Colon and Rectosigmoid and a Note on Excision of Hepatic Metastases

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SOMEWHAT more than 2 years ago the results in this clinic of primary resection of the colon without antecedent complementary or supplemental colostomy save in the presence of acute obstruction were set forth (34). At the same time a preliminary report was made upon efforts directed at salvage of sphincteric function in the radical abdominal operation for carcinoma of the rectal ampulla.

It is the writer's intent in this paper to report upon the experience of this clinic with the surgery of colonic malignancy since the time of the earlier report (April 1943) and to elaborate particularly upon a more extended experience with the operation for carcinoma of the rectal ampulla with attempts at preservation of sphincteric function. Whereas experience with this latter operation still has been

small nevertheless it has been adequate to indicate that in suitable cases radical excision of the lesion with preservation of sphincteric function is a feasible and practical procedure.

HOSPITAL MORTALITY IN PRIMARY RESECTION OF COLON AND RECTOSIGMOID

The earlier report referred to above embraced a 2 year period during which time 61 patients underwent colonic resection with 1 hospital death. During the 19 month interval which has elapsed since that report (April 1943 to November 1, 1944) an additional 78 patients have undergone resection of the colon including the rectosigmoid. All were primary resections save 2 in which exteriorization was done. One of these had a volvulus of the pelvic colon the other an inflammatory lesion in the transverse colon. There were 6 deaths in the group 3 of which are classified as unavoidable, 2 the result of peritonitis and 1 of pneumonia.

Unavoidable deaths. In 1 of these patients primary resection was undertaken at the time

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TABLE I—HOSPITAL MORTALITY

	A P m ry Resec				B Am Il ry Resec			
	N P	Hosp d h	3 P	L d th	N f	H d h	3 P	L d th
Se es I	6		6					
Se es II								
43	73	6	6					
44								
T I								
Comb d (I & II)	66							

of decompression of the colon for acute obstruction. This patient had a malignant growth in the pelvic colon with great distention. It obviously was a mistake in this instance to have undertaken decompression of the colon and primary anastomosis at the same time. The success of primary resection without antecedent or complemental colostomy in the earlier series suggested that it might be feasible to deal with the obstructed colon in the manner in which the obstructed small bowel is managed at operation by aseptic decompression suction enterotomy (). Upon decompression the edematous walls of the obstructed colon however appear to separate into layers making suture somewhat difficult. This occurrence was noted too in a subsequent case in which primary resection of the pelvic colon was undertaken soon after spontaneous decompression of an enormously distended colon.

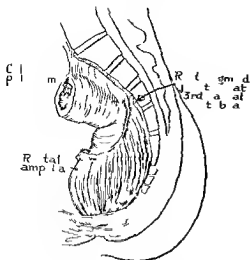
The other death from peritonitis occurred in a patient with a dubiously operable lesion adherent to the urinary bladder and the anterior as well as the posterior abdominal wall. In the light of the extensive operation undertaken in this patient it might have been well to have made a complemental colostomy. Obviously in the case of the patient with the acute obstruction an antecedent colostomy should have been carried out.

One of the avoidable deaths requires special comment. It occurred in an obese elderly man with carcinoma of the transverse colon who also had a moderately active diverticulitis of the pelvic colon causing some symptoms. Primary resection of the transverse colon was

done the patient dying of pneumonia. In this patient an exteriorization operation probably would have been tolerated better. It too would have been better treatment for the diverticulitis. The only other alternative would have been to excise the major portion of the colon anastomosing cecum to the terminal pelvic colon, an operation even more formidable than the one the patient did not survive. It would have possessed the advantage however of ridding the patient of the complicating diverticulitis.

The most complicated resections in this series of colon cases are constituted by the transverse colon group. Of the 1 patients in the group 7 had simultaneous resection of the stomach pancreas or other viscus. In these 7 patients the primary lesion was a gastric lesion, a gastrojejunal fistula or a carcinoma with invasion of the transverse colon. The case referred to was the only death in the transverse colon group.

The operative mortality for these two periods of study is summarized in Table I. For the earlier period the operative mortality was 16 per cent for the latter 76 per cent for both periods together 3 per cent. It is to be noted however that there were no unavoidable deaths in the first period whereas in the latter there were 3 (see Table I). In any series of patients operated upon for cecal malignancy the item of unavoidable deaths looms large (35). An element of unusual good fortune attended our efforts in the first series in which there were no deaths from unavoidable cause in the latter series half the deaths (5 out of 6) was unavoidable.



As has been indicated elsewhere gastric resections up to 95 per cent may be done without special increase of risk above that assumed in the elective 75 per cent resection performed for ulcer (33). When however the stomach is excised completely the mobilized esophagus is deprived of a portion of its blood supply common from phrenic and gastric vessels. Whereas a satisfactory suture can be made readily in total gastrectomy unless the esophagojejunal anastomosis is covered in the manner described by me in 1937 (31) and as also by Graham in 1940 (14) fistula formation late in convalescence with development of a subphrenic abscess is not unusual.

In ampullary resection there is no opportunity to cover the suture line posteriorly. And anteriorly it is not an easy matter this item will be referred to again with reference to rectovaginal fistula. As far as I can know or ascertain by rectal examination during convalescence after ampullary rectal resection in those instances in which a defect occurred in the suture line the fistula usually was on the posterior rectal wall.

CHOICE OF PROCEDURE IN AMPULLARY RECTAL RESECTION

In the initial report 3 methods of reestablishing intestinal continuity were described: (1) the Hochenegg pull-through method with Whitehead excision of the mucosa in the remaining distal segment; (2) the Hochenegg pull-through method leaving the rectal mucosa in the distal segment; (3) anastomosis of the proximal and distal segment through a proctoscope.

In the present series all of these three methods have been employed. I have come to feel however that the best method of reestablishing intestinal union in ampullary rectal resection is by the direct suture method made from within the abdomen by the method depicted in Figure 7. Thirteen of the 20 patients in this series were operated upon by the direct suture method. Since it may seem after mobilization of the rectum anastomosis may be effected by employment of straight clamps and a single row of fine silk Lembert sutures as close as 5 centimeters from the anus. Obviously it is not an easy anastomosis but

report will concern itself particularly with the experiences gained in this clinic with the problem attending resection of low lying lesions, reestablishment of intestinal continuity and preservation of sphincteric function.

CAUSES OF POOR WOUND HEALING IN RESECTION OF AMPULLARY RECTAL LESIONS

Granted satisfactory suture, primary healing is the rule in all resections of the colon and the rectosigmoid. The primary difficulty undoubtedly with the low lying lesions is the vascular factor. That is mobilization of the rectum to the tip of the coccyx accompanied by division of the middle hemorrhoidal arteries compromise satisfactory vascularization of the lower segment. Furthermore separation of the rectum from the sacrum leaves a space posteriorly in which fluid will accumulate unless provision is made for drainage.

In resections of the stomach, small intestine or colon the surgeon may determine readily by proximity of blood vessel to the segments to be anastomosed as well as by the color whether blood flow will be adequate. The situation in low lying rectal lesions with respect to resection is not unlike that of total gastrectomy done from within the abdomen.

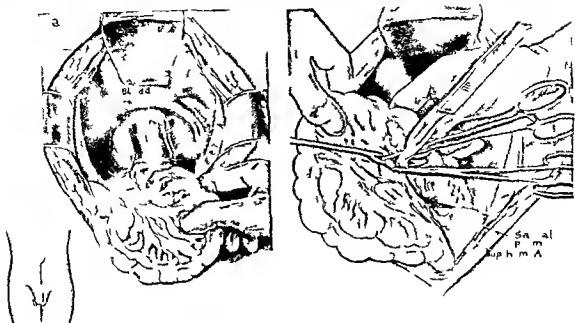


Fig 3 Th t hnuq f amp ll y tal t th p h h d l t y t th l t y
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an advantage of this method over anastomosis through the proctoscope is that it may be made as a closed anastomosis. It possesses the advantage over the pull through method that the proximal segment need not be so long in other words the suture method does not risk necrosis of the proximal segment or retraction as does the Hochenegg pull through method.

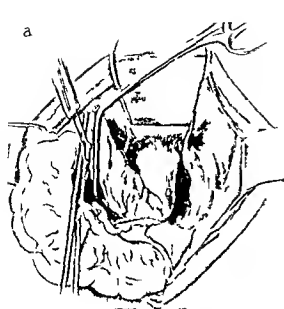
The rectum when empty is not straight as its name implies (Fig 2). There is a deep posterior curve and at least two lateral curves. Not uncommonly therefore when the rectum is mobilized fully the clamp may be applied at the conventional 3 centimeters beyond the lesion permitting resection and anastomosis to be carried out at approximately the same level as the distance which initially separated the anus and the lower limit of the lesion as determined by palpation and proctoscopic examination.

The patients upon whom ampullary rectal resection has been done have been wholly unselected. That is the operation has been done on every patient with carcinoma of the rectal ampulla in whom it was technically feasible to do it. Obviously in several instances the

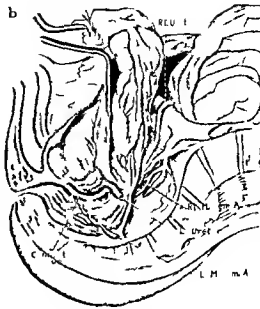
operation was undertaken as a palliative procedure in some of these as the experience reported herein will indicate ampullary resection is not a good operation in that in large circumferential lesions exhibiting local invasion and fixation of the tumor ampullary resection is followed frequently by local recurrence.

TECHNIQUE OF PRIMARY RECTAL AMPULLARY RESECTION

The operation is carried out with the patient in steep Trendelenburg position. Miss Daisy Stilwell medical artist has prepared the accompanying lucid drawings of the operative procedure (Figs 2 to 8) from sketches made after looking over my shoulder at two such operations. They illustrate the technique of the operation far better than I can describe it. The details of the operative procedure up to point of applying a clamp to the distal segment are identical with those of the abdominal perineal operation and consist of the following: (1) delineation of peritoneal flaps lateral to the colon; (2) isolation division and ligation of superior hemorrhoidal vessel at the sacral promontory (Fig 3b); (3) division of the



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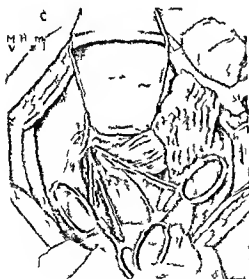
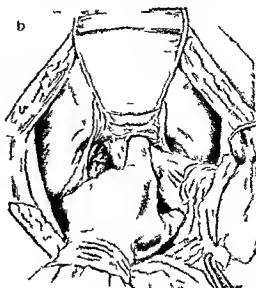
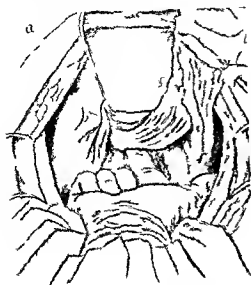
colon and pelvic mesocolon (Fig 4a) (4) mobilization of the rectum to insure excision of 3 centimeters of rectal mucosa beyond the lesion (Fig 5a b) and application of the clamp on the distal segment (Fig 6a) (5) preparation of the proximal segment for the anastomosis (Fig 6d e) (6) anastomosis with a single row of fine silk Lembert sutures (Fig 7) (7) through a short vertical perineal incision made directly in front of the coccyx the drawing down from the presacral space of a Penrose drain (Fig 8a b) (8) placement of a No 22 rectal tube through the anastomosis (9) ext aperitonealization of the anastomosis and closure of the pelvic floor (Fig 8c d) with suture of the lower portion of the peritoneal flaps beneath the colon and suture of the lateral margins of the colon to the peritoneum again thus effecting double closure of the pelvic floor. Great pains are taken to make an effective closure of the pelvic floor. The peritoneum is mobilized adequately to obviate tension and interrupted silk sutures insure firm union.

Cyclopropane supplemented by periodic small intravenous injections of curare has been the usual anesthetic agent. A moderately longitudinal vertical midline subumbilical or a para-

median rectus incision is employed. The wound is closed with interrupted sutures of fine silk.

In the earlier cases in which the Hochene pull through operation combined with the Whitehead procedure was employed of mobilizing the normal rectal mucosa beyond the lesion through the anus it became necessary to operate alternately from below and above. In order to facilitate that procedure the patient was draped on the table with the leg flexed somewhat. This position created a rather awkward situation particularly for a right handed first assistant who then found it necessary in the abdominal part of the operation to reach across the partially flexed right thigh of the patient with his right hand. Mr J. H. A. Phelan of the scientific apparatus shop at the university then built for me a small and cheap windlass which permitted the leg to be flexed or let down at will. Dropping the foot board of the operating table permitted access to the perineum from below. However the

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abdominal suture method of ampullary resection described herein has made use of the windlass important

THE QUESTION OF COLOSTOMY

In colon resections In this clinic antecedent or complemental colostomy has been reserved with few exceptions for the patient with acute obstruction of the colon. Many patients with mild symptoms of colonic obstruction have

been treated by an indwelling tube and large doses of mineral oil permitting resection and primary anastomosis. My associate Dr Clarence Denm (7) has called attention to the hazard of bringing about obstruction by the administration of a barium enema to patients presenting threatening signs of obstruction. In this clinic routine practice for some time in lesions throughout the entire colon including the rectosigmoid has been to perform resec-

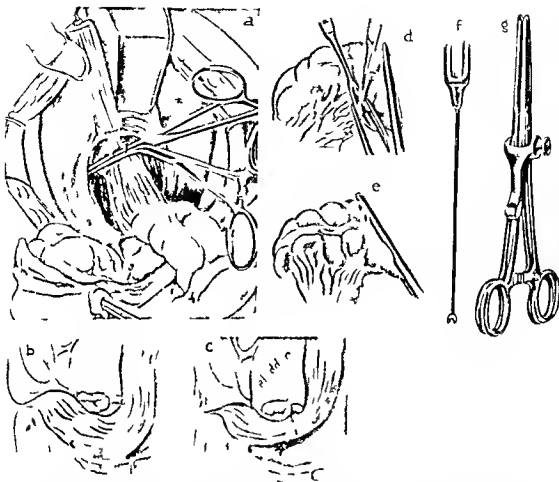


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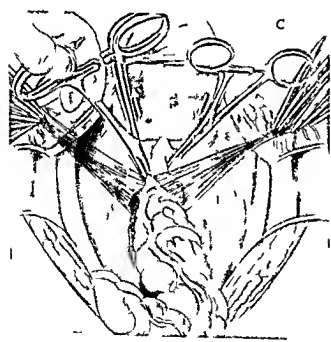
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tion and primary anastomosis without antecedent or complementary colostomy. The regularity with which primary union takes place suggests definitely that colostomy is unnecessary.

An indwelling duodenal tube is allowed to remain *in situ* for 4 and occasionally 5 days after operation. Our experience is that the

indwelling duodenal tube is superior to the Miller Abbott tube in the control of post operative distention. As has been repeatedly pointed out however it is important to employ suction during the induction of anesthesia and during the operation as well as in the early postoperative period. In other words effective use of the indwelling duodenal tube is the best prophylaxis against distention. The superiority of the Miller Abbott tube in the treatment of acute obstruction of the small intestine or in instances of mild

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colonic obstruction not demanding early operation is admitted freely
 In ampullary rectal resection however employment of complemental colostomy probably will be needed in unobstructed cases

more frequently than in primary resection of the colon and rectosigmoid In this series of cases particularly in those operated upon after the Hochenegg pull through plan supplementary colostomy because of persistent

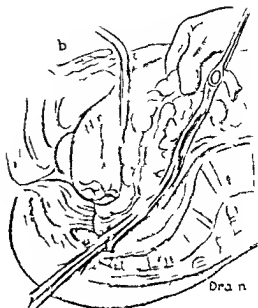
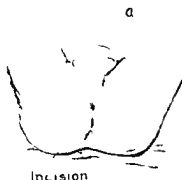


Fig. 9. The present method of coccyx abscess drainage.

fever became necessary in several patients—owing to retrorectal infection (Fig. 9). In the main, however, our present plan is to try to effect primary anastomosis by a single row of interrupted silk sutures elongating the peritoneal cul-de-sac by suturing the peritoneal flaps beneath the colon and draining the residual presacral space through a small incision in front of the coccyx (Fig. 10). Whereas as has been indicated a temporary fistula occurred in the larger number of these cases primary healing without evidence of fistula took place in 4 of 13 patients operated upon by the primary intra-abdominal suture method. In 10 of the 13 patients in this group a supplemental colostomy was made because of the occurrence of a rectovaginal fistula. Slight elevation of temperature ordinarily heralds the occurrence of a leak in the suture line. Often a systemic reaction. Some fecal material comes away through the drainant. The anus is irrigated 10 or three times a day. When the patient becomes afebrile or when it is clear that the leak in the suture line has occasioned no untoward symptom the drain is withdrawn. In a few days the external fistulous opening closes spontane-

ously and the small retrorectal abscess cavity becomes obliterated and the defect in the rectal wall heals. The No. 22 rectal tube thread is allowed to remain in place for nearly a week. 3 days after operation it is withdrawn a centimeter to obviate the possibility of the tip of the tube pressing upon the wall of the pelvic colon causing pressure necrosis. Three days later the tube is withdrawn. In resections of the terminal pelvic colon in which the rectum is not mobilized posteriorly no attempt ordinarily is made at operation to pass a rectal tube beyond the anastomosis for too often easy entry of the tip of the tube into the pelvic colon is prevented by Houston's valve.

SULFONAMIDES UNNECESSARY

As was indicated in the earlier report the only preoperative preparation of the colon and rectum employed in this clinic is the preoperative administration of enemas preceded by the liberal oral administration of mineral oil. It is an empty bowel that is desired. It has not been our practice to employ succinyl sulfathiazole in colonic or rectal surgery. Moreover the local implantation of small

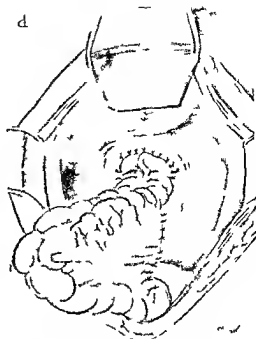
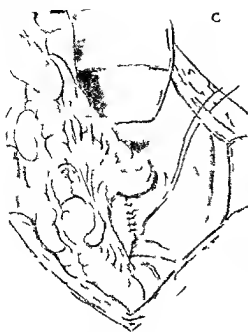


Fig 8 l ft Th p t l ft p t dt th
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amounts of sulfathiazole referred to in the earlier report has been abandoned. In those instances in which a urethral catheter is employed small daily doses of sulfadiazine are given in the early postoperative period to thwart urinary tract infection.

DIETARY MANAGEMENT

All patients are fed a high protein and carbohydrate and low fat diet for a few days prior to operation. In patients who have lost considerable weight the preoperative dietary preparation must be long enough to permit the lipotropic action of such a diet to rid the liver of its excess fat—for patients with fatty liver stand operation poorly. The details of this management have been described elsewhere (9, 33).

THE OCCURRENCE OF RECTOVAGINAL FISTULA

We have learned that drainage through the vagina is inadvisable in any of the methods of ampullary rectal resection. If perirectal supuration occurs a persistent rectovaginal fistula may follow. Moreover a spontaneous

rectovaginal fistula has been observed twice without drainage of the vagina. My colleague, Dr. John L. McKelvey (17), professor of obstetrics and gynecology (1944), informs me this occurrence is probably owing to the dependence of the posterior vaginal wall on the blood flow from the middle hemorrhoidal arteries which are divided regularly in the operation of rectal resection—an expression which finds confirmation in the anatomical observations of Quenu (4, 1893). The distribution of the branches of the middle hemorrhoidal arteries is principally upon the anterior wall of the rectum above the levatores while the branches of the inferior hemorrhoidal arteries are dispersed largely upon the posterior wall below the levatores (Cunningham). There is no marginal artery of the rectum as in the colon. As the three hemorrhoidal arteries reach the rectal wall they break up into branches which are distributed over and through the rectal wall.

Later, in adherent lesions in the female I have excised the uterus and the upper portion of the vagina coincident to reestablishing



F. Drummond's diagram of the rectal anastomosis after temporary resection of the rectum. (T. H. C. 4)

T. H. C. 4. Diagram of the rectal anastomosis after temporary resection of the rectum. (T. H. C. 4)

intestinal union in ampullary resection thus insuring better removal of the tumor and avoiding simultaneously the hazard of a rectovaginal fistula. In a recent case after such a procedure primary union occurred the suture line being 5 centimeters from the anus (Fig. 10).

ARTERIES OF THE RECTUM

Steward and Rankin (1933) gave good account of our available knowledge on the blood supply of the lower colon and rectum. Quenu (1893) and Drummond (1914) have both stressed the inconstancy of well developed anastomosing vessel between the middle hemorrhoidal and the superior hemorrhoidal arteries above the levators on the one hand and between branches of the middle hemorrhoidal and branches coming from the inferior hemorrhoidal beneath the levators on the other. The latter communication is even more feeble than the former.

In one of 3 directions Quenu failed to demonstrate any communication between branches of the superior and middle hemorrhoidal arteries on the rectal wall in the remnant. The communication was unilateral and not with anastomosing branches on both sides of the rectum as one might expect. Drummond believes the middle hemorrhoidal artery to be an inconstant vessel inasmuch as he was able to demonstrate its presence employing the x-ray injection technique only 3 times in 17 specimens. His diagrams emphasize the importance of the superior hemorrhoidal artery in vascularizing the rectum.

Quenu states that the middle sacral artery gives off usually three small branches at the level of the last sacral vertebra to the posterior aspect of the rectum. Pope and Buie (1919) describe a rectal plexus to which small branches of the middle sacral artery supply inconstant component.

The superior hemorrhoidal is the chief artery of the rectum and inasmuch as the paired middle and inferior hemorrhoidal arteries are variable and inconstant it is understandable that attending division of the superior and middle hemorrhoidal arteries ampullary rectal resection difficult with wound healing, and temporary rectal fistula are not uncommon. It has been pointed out

previously that Sudeck's (1907) critical point has no importance in excision of the colon pelvium and the upper rectum. Probably only in the pull through operation is Sudeck's critical point really important. In that procedure as has been pointed out the proximal pelvic colon must be several centimeters longer than is necessary in ampullary resection by the primary suture method. Whereas the bowel is usually long enough the primary difficulty with the pull through maneuver relates to the shortness of the vessels in the mesentery despite all efforts at lengthening them. If the sigmoid mesoartery is cut the marginal vessels along the mesenteric border of the colon may be inadequate to vascularize it. In consequence necrosis and retraction of the segment drawn down through the anus may occur. As in ampullary rectal resection the superior hemorrhoidal artery is divided also in rectosigmoid resections however in the latter operation the communications between the terminal branches of the superior hemorrhoidal and the middle hemorrhoidal on the rectal wall are not disturbed and difficulty with wound healing does not occur.

AMPULLARY RESECTION FOR ULCERATIVE COLITIS

Three of the 27 patients in whom ampullary resection was done had ulcerative colitis. The remaining 24 had cancer of the rectum. In 1 of the 3 patients with ulcerative colitis there was a localized lesion extending from 9 to 14 centimeters from the rectum permitting ampullary resection with anastomosis to the proximal portion of the pelvic colon. In another the whole colon was involved and a rectal stricture was present 10 centimeters from the anus (No. 11 specimen 8) in this instance the end of the ileum was sutured to the terminal rectum. In the third patient referred to in the initial report the whole colon and rectum were involved necessitating complete excision of both the problem being resolved by pulling the ileum down through the external sphincter after the Hochenegg pull through method accompanied by Whitehead excision of the rectal mucosa from the distal segment. Primary healing did not occur.

in any of these 3 patients.¹ Rectal function has been quite satisfactory in the first patients. As was indicated in the first report in the instance of the patient with complete colectomy and proctectomy recourse had to be had to a secondary ileostomy. This patient can retain 4 ounces of water administered by a rectal tube for a period of 8 minutes without too great difficulty and the prospect of again establishing intestinal continuity appears not unlikely. If the Whitehead excision of mucosa from the distal segment had not been employed the prospect of satisfactory rectal function in this patient undoubtedly would be even better.

Sphincteric function Ampullary resection was undertaken in 27 patients of these 2 died in hospital. In 2 of the remaining 5 patients surviving ampullary resection in whom a supplemental colostomy became necessary no opportunity was afforded to test sphincteric function one of these Mrs M R Univ Hosp No 743136 aged 68 years had hepatic metastases and a growth adherent to the cervix and posterior vaginal wall. A local recurrence precluded secondary closure of the colostomy and excision of the two hepatic nodules. Additional experience has suggested the advantage of excising the uterus and the upper portion of the vagina in such patients. The other patient Mrs R F Univ Hosp No 746841 aged 68 years developed evidence of a pyelonephritis after leaving hospital and died 2 months after operation of a pulmonary embolus. The predisposition of patients having colostomy to development of urinary tract infection appears to be well established.

Of the remaining patients sphincteric function appears to be satisfactory in the majority. All the patients in the group have been followed and observed from time to time. In order that patients might not be persuaded to give more favorable replies at the time of examination than the situation warrants, the following inquiry was sent to all patients having had ampullary resection:

- 1 Is the rectal control satisfactory?
- 2 Are there periods when the control is not satisfactory?

4 d h l p a b c e r y v e c o l h a i d
l e c m d p a i p r o c e r m y h d e i
u m d n a w h p m r y

TABLE II—RESULTS IN 27 PATIENTS UNDERGOING AMPULLARY RECTAL RESECTION—Continued

N m d hos l mb	S Ag	D f les f m m	Ch t f l	ppl l m l my	C mpl	Le f h hos y l l pe d y	Sph l	P m k
III S t A m th gh P oct sc p—C d								
M I F 5	M 5		L C g m f M l l W gh 95 gm Le f h 9 m		Obc p pos f		Go d	Cl l l los m E D h b f m m m h pos pe
IV P m ry Closed A mos (S f m Abo)								
Mrs E E 6	F 66	8	U l B V h b pol po d l Le b 5 m	N	N		Ex ll	W ll
M R V 3	F	8	U l B W ed l h b gm m Le b gm m	Yes	Pos fec		E ll Col losed m	W ll
M T D 1			U l B V h b 8 m l l Le b 9 m	N	P pera bo h b brom		E ll	W ll
M I R F		6	B d cure C re d m f l l b W gh 1 g Le h gm m	N	P R p ov fec fa l ov g l l	8	N bserv	D d 6 m f pe H sed m
S M ab K F			U l l R m l f m d ppr	II m	Pos fec	6	E ll	W ll II on my l sed
I C M so			U l B f l V h b L h 65 gm m	N	N		N b	D d 5 h pos h mbo d y
M CL F 6	6		S l C 8 l V iso pol p go m m Le h	N	Ob po pe g l f l Rec	6	Good f ec o m l fa ul	W ll R f l f p l f l
M OC 44	1		L h C W m f l l d L h 8 m m	N	P f ac	7	Good l	Loc l ecu po d d t d h b
B J C M			Broad rc B l m f l l l segm l Lo m l h 5 m l pe m m we h 5 m seg l h m	N	Pos	5	E cell	W ll H d rrb l d h h oap l
rs R F 8	8		La g C l ou l h l us Le h m m	C m l m m los- m be- us l m sa pe (Ope mo-)	P l h ac pos- fec-		N bserv	Colos my l lan ry mbol m so b m h m f d m sal

TABLE II—RESULTS IN 27 PATIENTS UNDERGOING AMPULLARY RECTAL RESECTION—Continued

Names	Sex	Age	Diagnosis	Ch	Ill	Sphincter	Complications	Length of hospital stay	Sphincter	Postoperative results
Mrs E J 7	F	6	Primary Closed Anus	Normal	Normal	Normal	Normal	Normal	Normal	Will
5 M M C 7 69	F		Ulcer	Normal	Normal	Normal	Postoperative	Normal	Good	Will
6 Mrs E S 50	F		Primary Closed Anus	Normal	Normal	Normal	Obesity	Normal	Normal	Satisfactory Hepatic
7 M J O 7	M	1	8	La	Normal	Normal	Postoperative	Normal	Good	Normal

3 Do you find it necessary to wear a diaper or take other precautions against soiling?

4 Can you control gas?

5 Has your activity been limited in any way by the operation on the rectum?

The replies to this questionnaire tallied quite closely with our own evaluation and the results appear in Table II. The patients with excellent or normal sphincteric function all had ampullary rectal resection by the suture method. The same set of questions was submitted to the patients who had undergone resection for carcinoma of the rectosigmoid. Uniformly the sphincteric function of that group seemed to be normal.

The preservation of normal or nearly normal sphincteric function in the majority of the patients undergoing ampullary rectal resection has been very gratifying. In patients in whom a rectal fistula developing from a leak in the suture line was slow in healing and healed with a persistent defect, the rectal wall rectal continence has been impaired. Moreover a rectovaginal fistula has marred an otherwise satisfactory continence in 2 patients. Equally or even more important than local causes in disturbing sphincteric function have

been mental changes owing to senility. Patients who have undergone ampullary resection must be more alert to the necessity of evacuating the lower bowel than the patient with an intact rectum.

Babcock (1932) removes the sphincters and establishes a perineal anus in doing the radical operation for rectal cancer. Babcock and Bacon (1942) assert (3) that the phincterless perineal colostomy is to be preferred to the abdominal colostomy. Whereas for sentimental reasons the perineum may appear to be a more desirable location for an artificial anus it would seem better to have such a colostomy opening where it may come more directly under the watchful eye of its owner.

Preservation of sex function in males. Loss of sex function or impotence in males after the abdominoperineal operation is well known. Apparently in patients undergoing ampullary rectal resection as in patients having had excision of the rectosigmoid there appears to be little or no impairment of this function.

LOCAL RECURRENCE

Of the 27 patients in whom ampullary resection was done, the operation was un-
der

taken for ulcerative colitis the remaining 24 had cancer of the rectum. Two of these failed to survive operation. Of the 22 patients surviving ampullary resection for rectal cancer 3 had evinced evidence of local recurrence. In 4 of these ampullary resection was undertaken as a palliative procedure. Yet even in these patients the abdominoperineal operation would have given better assurance against local recurrence. This matter of local recurrence in large fixed lesions has been the most disappointing experience in this effort directed at preserving sphincteric function in ampullary resection. Two of these 3 patients had hepatic metastases at the time of operation. One of these Mrs. M. R. Univ. Hosp. No. 743136 was mentioned under the discussion of the complication of rectovaginal fistula. In one patient the large fixed resected lesion proved to be a gelatinous carcinoma. An abdominoperineal operation was done subsequently but the lesion has recurred again. Miles (1931) states (19) that such gelatinous carcinomas as well as melanotic lesions are not curable by any known means. Broders, Buie and Laird (1940) and Norbury (1941) while allowing that colloid cancers are usually highly malignant are not as pessimistic over them as Miles. Dukes (1940) places all colloid or mucoid cancers in a separate and distinct group (11). All 3 of the patients in whom recurrence developed in this series had large fixed low lying lesions which had penetrated the fascia propria of the rectum presenting at the same time metastatic lymph nodes in the pelvic mesocolon. The first ampullary resections reported herein were done in 1942 in other words even the first patients in the group were done less than 3 years ago. The elapse of additional years obviously will be required before one can evaluate the factor of long term survival.

Gilchrist and David (1938) studying cleared specimens excised in the abdominoperineal operation for rectal carcinoma found metastatic lymph node in 68 per cent of the cases. Collier and his associates (1940) in 64 per cent and Gabriel and his associates (1935) observed lymph node metastases in 62 per cent of dissected specimens. Gilchrist and David concluded that large tumors may have no lymph

node metastases whereas small tumors may occasionally present evidence of extensive lymphatic spread. They point out further that when there is gross involvement of high lymph nodes there may be retrograde metastases to lymph nodes lying below the tumor.

Whereas Collier and his associates (1940) failed to find evidence of lateral lymphatic spread in lesions lying more than 3 centimeters above the anorectal line I am convinced from the experience with low lying fixed lesions that an operation which does not excise the levator muscles in juxtaposition to the bowel invites local recurrence. In the 3 instances reported herein in which local recurrence followed ampullary resection the local invasive qualities of the tumor may have been responsible. Yet I believe it would be safer to suggest that ampullary resection in such instances can be indicted on the score of failing to remove the lateral zone of lymphatic spread as well as in its failure to deal adequately with the item of local invasion. Miles (1931) states that the levator ani muscles are especially prone to invasion by cancer cells which have gained access to the extramural lymphatic system of the rectum (20).

The primary defect in the perineal operation for rectal cancer apart from the loss of sphincter function is that it fails to deal with the upward zone of spread. The potential defect in ampullary resection for rectal cancer is that when applied to unsuitable cases patients with large low lying lesions it fails to deal with the item of lateral lymphatic extension via the fascia overlying the levator muscles further it compromises somewhat on the extent of excision of the rectal wall distal to the lesion. From the standpoint of cure of rectal cancer obviously the abdominoperineal operation is the best procedure. In how many instances however would ampullary resection protect equally as well against recurrence and at the same time save the patient's sphincter? Many surgeons latterly are coming to the point of view in the management of cancer of the esophagus if esophagogastric or esophagojejunal anastomosis can not be effected that the patient should not be subjected to the alternative procedure of the Torkelson operation with establishment of an external

fistula. An exteriorized esophagus is a severe handicap contrasted with the lesser troubles of a colostomy. Nevertheless it is perhaps not out of place to point out that surgeons can make but a poor imitation of the rectal sphincters which nature bountifully bestowed on us neither can one be bought at any price in any market open or dark.

A number of studies indicate that approximately 50 per cent of unselected patients subjected to the abdominoperineal operation survive 5 years without recurrence. Jones (15, 1929) 47.8 per cent. Lamberton and Dixon (16—1934) 35.8 per cent (includes all operations for cancer of the rectum). Abel (1935) 38.3 per cent. Jones (16—1936) 52.6 per cent for the onc stage and 51.3 per cent for the two stage abdominoperineal operation. It is reasonable to infer that the losses by death from recurrence of the malignant growth are sustained largely in the group exhibiting local invasion and lymph node metastases (Dukes group C). In other words even the best and most radical operation is inadequate for a large number of such cases. Dixon (1944) informs me that in a series of 100 patients with rectal cancer operated upon more than 5 years previously there were no 5 year survival among patients whose lesion fell into Dukes group C. Similarly in a small series also reported from the Mayo Clinic by Seefeld (1942) there were no 5 year survivals in patients whose lesions were placed in Broders' group IV. Among 191 patients whose excised lesions were classified in Dukes' group C Broder, Buie and Laird (1940) found only 14.6 per cent of 5 year survival and among 18 patients whose lesions were placed in Broder's group IV they observed only 11.1 per cent 5 year survivors. In this connection Mile (17—1933) the innovator of the abdominoperineal operation said concerning it: "Should it be reserved for advanced cases only as advocated by some then the invisible spread will have advanced beyond the confines of the operation field and recurrence will be inevitable (18). It would be difficult to justify any operation for cancer on the basis of accomplishment in the late case."

In this study Dukes (19—193, 1940) well known scheme of classifying rectal tumor

has been employed. It is my impression that Dukes' scheme may not be as useful to the surgeon as it is to the pathologist for it implies that metastases do not occur unless local invasion has occurred. It would be more in keeping with surgical experience to indicate that any malignant tumor with or without local invasion beyond the confines of the rectum may be accompanied by lymph node metastases even though the incidence mounts sharply when the primary tumor exhibits definite evidence of local invasion.

HEPATIC METASTASES

The occurrence of hepatic metastases indicates definitely that vascular embolism of tumor cell occurs in malignancy. Coller and his associates (1940) noted evidence of direct local invasion of venous channel in 15 per cent of the rectal specimen studied.

Coincidental partial hepatectomy for direct extension of a malignant growth into the liver at the time of gastric resection for cancer has been described previously (3,5). A more protracted period of observation of the patients in which that procedure was carried out confirms the validity of the worthwhileness of such a maneuver. Because of the length of survival of many patients undergoing primary resection of the colon for cancer preventing hepatic metastases at the time of operation. I suggested previously that secondary excision of hepatic metastases reasonably might be undertaken in such case. It is only within the past year however that I have been able to persuade patient to undergo such secondary resection. If protracted followup in such patients should indicate that survival is no greater than in a similar group in which the metastases are left one might yet learn some thing of the manner of growth of hepatic metastase. My feeling is that if at the first operation the local lesion and the lymphatic drainage area can be excised satisfactorily secondary excision of the hepatic metastases 6 to 8 weeks later may cure the lesion. Failure to palpate metastase not near the surface in an organ as thick as the right lobe of the liver is admitted freely.

Hemostasis is not a difficult problem in excision of hepatic tissue. There is so much

fibrous tissue in the liver that bleeding may be controlled readily. The cautery is employed to remove the section of the liver involved. Large vessels are seized with hemostats as they are encountered and the vessels are ligated. In a deep wound the vessels in the liver substance can be distinguished readily by palpation that is the hepatic substance may be readily compressed between thumb and forefinger disrupting the tissue continuity leaving the vessel intact. Fibrin foam (Cohn) has been a helpful adjuvant agent in the control of parenchymatous oozing. When the vessels which traverse the defect in the liver are ligated however ordinarily the problem of hemostasis is not particularly difficult. The adjacent edges are sutured if possible with a running suture of catgut and the transverse mesocolon or other available omental structure is employed to sew over the defect with the thought in mind of localizing the inevitable temporary bile fistula. External drainage, therefore always provided and temporary external drainage of bile is usual.

During the past year three such secondary excisions of metastases have been undertaken. Two of these secondary partial hepatectomies were done for rectal malignancy in which an antecedent ampullary resection was done and one in a patient who developed a local recurrence following an exteriorization operation done elsewhere for a carcinoma of the pelvic colon. Six weeks after simultaneous removal of the colostomy the local recurrence in the abdominal wall and performance of primary anastomosis metastases were excised from both lobes of the liver (Fig. 1 specimen C). In one of the rectal cases the metastasis was large and single involving the lateral portion of the right lobe of the liver. The gall bladder was freed and deflected to the left. The excised liver tissue weighed 335 grams (1 of 2 specimens A and B). These two patients continue well. In the other patient two metastases were present in the right lobe of the liver. This patient also had a large fixed noninflammatory lesion that was removed with difficulty the Blochensky pull through operation being done. Supplemental colostomy became necessary because of fever and perirectal suppuration. A few weeks later the

colostomy was closed and the hepatic metastases were excised at the same time. The rectal function was quite satisfactory. A few months later however evidence of local recurrence became apparent. This patient died of local recurrence involving both ureters somewhat more than 10 months after ampullary resection. Two hepatic metastases were again present in the right lobe of the liver at autopsy. Whether these final hepatic metastases were the result of inadequate removal of the initial hepatic metastases failure to palpate occult subsurface metastases or failure to remove the local lesion completely cannot be determined.

AMPULLARY RESECTION COMBINED WITH REMOVAL OF METASTATIC LYMPH NODES PROXIMAL TO THE PELVIC MESOCOLON

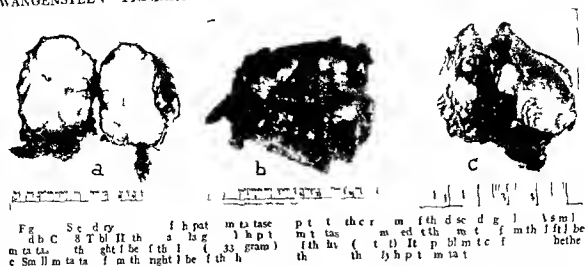
Mention has already been made of instances in which resection of the whole colon and the greater portion of the rectum was made for ulcerative colitis. In a patient Mr. J. C. Univ. Hosp. No. 744810 aged 53 with carcinoma of the rectal ampulla presenting lymph node involvement proximal to the pelvic mesocolon following excision of these nodes and the inferior mesenteric artery at its site of origin from the aorta it became evident that the left colon was not adequately vascularized through the midcolic artery and the marginal branches of the left colic artery. In consequence it became necessary to mobilize the entire colon up to and including the hepatic flexure (Fig. 11 specimen 7). The left half of the transverse colon was finally anastomosed to the rectum. If the transverse colon had not been so long it might have been necessary to anastomose the cecum to the rectum. This patient has satisfactory sphincteric function. In the earlier report it was indicated that the terminal ileum or the cecum had been anastomosed to the terminal pelvic colon in 7 patients without mortality.

INDICATIONS AND CONTRAINDICATIONS TO EMPLOYMENT OF AMPULLARY RESECTION

It is to be admitted freely that this operation cannot compete in all cases of rectal cancer with the abdominoperineal operation. It is immediately apparent that its employment is contraindicated in juxtaspincteric malignancy.



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nancies on the score of inadequate removal of the local lesion furthermore in all lesions at the level of the levator muscles the operation is contraindicated on the score that this procedure does not permit division of the levator muscles and adequate removal of the lateral zones of lymphatic spread

Hence in all large fixed ampullary lesions in which the tumor has extended beyond the confines of the fascia propria of the rectum and a real opportunity for spread into the lateral lymphatic zone exists ampullary resection should not be undertaken In other words in instances in which there is real hazard of local recurrence the abdominoperineal operation should be favored over ampullary resection Apart from these considerations the operation of ampullary rectal resection described herein would appear to deal as well with the problem of rectal cancer as does the abdominoperineal operation The avenues for upward lymphatic extension of malignant growth into the pelvic mesocolon can be dealt with equally as well by the operation of ampullary resection as by the abdominoperineal operation

DISCUSSION

The following are the items which concern both patient and surgeon in this and any other operation for malignancy (1) operative mortality (2) possible complications of operation (3) prospects of ultimate cure (4) function
 1 reservation of sphincteric function is the special consideration which compels interest

in ampullary resection The operation appeals at once to the patient The thought of a colostomy is ordinarily abhorrent and frequently revolting to a patient Mere mention of a possibility of saving the sphincters immediately arrests the patient's interest There are patients who will not accept a colostomy There were a few such patients in this group Yet 2 such patients when evidence of local recurrence developed following ampullary resection for fixed circumferential lesion will inly accepted colostomy and subsequent efforts directed at extirpating the recurrence All surgeons have had experience with patients who will not submit to operation if told they have cancer Obviously they are unreasonable but this type of mania sometimes defies being set aside An operation which must be defended on the thesis that it may be a satisfactory substitute for patients who are more interested in preservation of function than in cure is obviously not a good operation for cancer

There are patients for whom a colostomy is a heavy and tragic burden The majority of reasonable patients however learn to deal with the situation and tolerate colostomy without complaint It is probably fair to say however that it is far easier to advise acceptance of colostomy than it is for the patient to resign himself to it Only once has a patient hunted and threatened me with a gun That patient had a colostomy performed in this clinic because of acute obstruction caused by

an irremovable malignant lesion in the left colon. He demanded that the colostomy be closed. I thought he was *unreasonable*; he thought we were because we failed to comply with his wishes.

It is to be admitted that postoperative complications are more frequent in patients undergoing ampullary resection than in those accepting the abdominoperineal operation. A defect in the suture line with a temporary retrorectal fistula is a rather common complication. The length of the postoperative hospital stay in this group of patients has been long made so essentially by necessity for supplemental colostomy in a number of the patients. In the earlier series reported the average postoperative hospital stay for primary resection of the colon and rectosigmoid was 14.3 days. That figure has not been computed for the 78 colon resections reported herein but it is undoubtedly shorter because the majority of patients having resections of the colon through oblique or transverse incision are now leaving hospital before the tenth postoperative day. A trying complication has been a rectovaginal fistula in the female. I have the impression however that more frequent coincident excision of the uterus and the upper portion of the vagina in the instance of adherent tumors will eliminate this hazard. Under no circumstances should drainage be established through the vagina in ampullary rectal resection.

Despite the complication of a temporary retrorectal fistula which has been dealt with in the majority of more recent cases solely by provision for perineal drainage just anterior to the coccyx I have the impression that ampullary resection can be done at risks not far out of line with those run by patients undergoing the abdominoperineal operation.

Time will indicate whether the ultimate results of this operation evaluated on the score of 5 year or longer period of survival without evidence of recurrence are as good in properly selected cases as in the more radical abdominoperineal operation. That the abdominoperineal operation is a better procedure for low lying lesions and particularly in large fixed circumferential low lying lesions in which the

opportunity for lateral lymphatic spread of the tumor is great already has been admitted.

Perhaps in no type of cancer would effort at instruction of the public in the early recognition of the symptoms of rectal cancer prove more helpful. Were it not for the confusion of bleeding hemorrhoid every patient with rectal bleeding should come for examination to have the diagnosis of rectal cancer disproved. Much more can still be done to instruct the public on this score. Granted early diagnosis a far larger number of patients could have ampullary resection with sphincter preservation rather than the abdominoperineal operation and colostomy. In a study of 1,401 cases of cancer of the rectum and rectosigmoid Bacon (1938) in reviewing the location of 1,401 carcinoma in the pelvic colon and rectum stated the distribution to be as follows: sigmoid 2.5 per cent, rectosigmoid 16.5 per cent, rectum 56.1 per cent and anal canal 4.9 per cent. Only 19.1 per cent of these 1,401 neoplasms were less than 1 inch from the anorectal line. Dividing the rectum into three parts of which the lowest is the shortest and the upper the longest portion Duke (1940) found in a group of 913 rectal cancers 56.6 per cent in the lower third, 36 per cent in the middle and 30.8 per cent in the upper third. Inasmuch as ampullary resection can be carried out in the midrectum quite regularly and as low as 5 centimeters from the anus in suitable instance particularly in thin women with a deep cul de sac in instance of rectal carcinoma diagnosed early the method would appear to have a wide range of applicability. In this clinic ampullary resection has reduced materially the number of abdominoperineal operations however it has been indicated we already have learned that the method has no place in low lying lesions in juxtaposition to the anastomosis and particularly in large fixed low lying lesions.

COMBINED BARIUM AND PROCTO SCOPIC EXAMINATION

An item not to be forgotten in all colonic and rectal operations for malignant growths is that excision of an extra segment of bowel occasionally brings with it an unexpected polyp. In the clinic therefore all patients in

whom cancer of the colon is diagnosed by the roentgenologists undergo proctoscopic examination prior to operation. Similarly all patients in whom cancer of the rectum is diagnosed by the proctologist receive a barium enema to exclude the possibility of another malignant tumor or a polyp more proximally situated. All lesions within the reach of the sigmoidoscope also are subjected to diagnostic biopsy before operation is undertaken. Mayo and Schlicke (1942) stated that in 100 consecutive autopsies on patients between 22 and 80 years (average 54.7 years) dying of conditions unrelated to the colon polyps were found 16 times and in 8 of these beginning cancerous changes were present.

SUMMARY

Primary resection employing the closed anastomosis is without antecedent complementary or supplemental colostomy. It is used in this clinic as the operation of choice in all unobstructed malignant growths of the colon. Similarly in suitable lesions in the ampulla of the rectum primary resection (closed anastomosis) can be carried out satisfactorily. Whereas primary healing and in consequence short postoperative hospital stays are the rule in primary resection of the colon and recto sigmoid in ampullary rectal resection primary healing is not usual. This circumstance is owing to the sole dependence of the surviving lower rectal segment upon the inferior hemorrhoidal arteries following division of the superior and middle hemorrhoidal vessels and mobilization of the rectum which ordinarily deprives the lower rectal segment of the branches coming from the middle sacral artery as well as nevertheless ampullary rectal resection with primary anastomosis usually can be done without colostomy provision being made for perineal drainage of the presacral space which may become infected because of a defect in the suture line. Supplemental colostomy however has been necessary in several instances to deal quickly and more effectively with the item of posterior space infection.

The chief defect in the operation of ampullary resection is that it is not a good operation for large fixed low lying Dukes group C malignant growths. Whereas the tumor can

be mobilized and a satisfactory anastomosis made even in such cases the opportunity for local recurrence is great in that the operation does not remove the levator muscles and the lateral zones of lymphatic spread. In suitable small low lying lesions and in most lesions of the upper rectum this experience with rectal resection suggests that it is a satisfactory operation for cancer. Ampullary resection also has been done for ulcerative colitis.

Sphincteric function in most cases has been good after ampullary resection. The primary closed suture method appears to be the most satisfactory operation.

The hospital mortality for primary resection of the colon and rectosigmoid has been 5 per cent and for ampullary rectal resection 7.4 per cent.

Secondary excision of hepatic metastases is described.

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METABOLIC ALTERATIONS FOLLOWING THERMAL BURNS

II Changes in the Plasma Volume and Plasma Protein in the Convalescent Phase

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THE purpose of this paper is to present the alterations that occurred in the plasma volume the available (thiocyanate) fluid volumes the total circulating plasma protein the total circulating albumin and the hematocrit value of burned dogs during the convalescent period. It has been shown (8, 16) that during the first 36 to 48 hours after burning there is a diminution in the plasma volume. Because of this diminution and because of the questionable accuracy of plasma volume determinations during shock the present studies were confined to animals that had fully recovered from the immediate shock phase.

MATERIALS AND METHODS

Normal adult female mongrel dog were employed. The dietary management and the preparation of the animals are described in another publication (4). (Animal 7 and 8 were simultaneously employed in both studies.) Control blood studies were obtained after the animals had been maintained on a constant diet for 3 to 4 weeks. Following the burn all of the animals except dog 9 were able to continue on the same diet.

All blood samples were obtained in the morning after a 12 to 18 hour fast. Heparin was used as the anticoagulant. Undue stasis was avoided and greased syringes were employed to prevent hemolysis. Hematocrits were done in duplicate in Sanford Magath (7) cell volume tubes the total plasma protein concentration was done in duplicate by the micro Kjeldahl technique. Plasma albumin concentration was determined by the method advo-

cated by Hill and Trevarrow except that five times the amount of plasma and globulin precipitant was employed

The plasma volume and available (thiocyanate) fluid volume were determined by injecting simultaneously 868 milligrams of Evans blue dye (T 1824) and 483 milligrams of sodium thiocyanate¹ according to the direct method of Gregersten and Stewart as adapted to the photoelectric colorimeter by Gibson and Evelyn. The disappearance slope of the Evans blue dye was determined by four points and was found to vary only slightly during the control or postburn studies.

$$\text{Blood volume} = \frac{\text{Plasma volume}}{\frac{\text{Co Hb m t}}{\text{r t}}} \times 100$$

Since it is generally appreciated that the true blood volume cannot be determined in this manner (14) no absolute conclusions will be based on these findings but it was thought that the percentage changes might be of some interest because of the alterations that occurred in the plasma volume and in the hematocrit.

A few days after the control blood studies had been obtained the animals were burned under intravenous nembutal anesthesia. They were burned over the thorax and abdomen which had previously been shaved. Irons with a burning area of 12.57 square centimeters were employed being heated in boiling

was determined by the method above

hydration Shen Ham and Fleming have shown that anemia is present in the convalescent phase of burns because of an accelerated breakdown of red cells due to an increased fragility.

Our data also show a definite diminution in the red cell mass. Whether this is entirely due to an increased breakdown of red cells or in part a result of the crowding out of red blood cells by the increased plasma volume is not definitely known. Conversely we are unable to say whether the increase in the plasma volume is due to an attempt to compensate for the decrease in red cells or whether it is caused in part by retention of fluid and electrolyte. Peters and Van Slyke and Warren Merrill and Stead have stated that often a compensatory rise in the plasma volume occurs when anemia is present but since there is disagreement on this point (3) the anemia seen in our burned animals may not be the sole explanation for the rise in the plasma volume.

Although the plasma volume was increased in most instances there was interestingly a decrease in the total circulating plasma albumin which accounts for the major osmotic pressure of the protein fraction. Cope recently stated that an increased plasma volume apparently occurs 4 to 5 days after a burn and intimates that this may be due to the reabsorption of previously lost protein. That the rise in plasma volume is not due solely to the reabsorbed protein seems likely. In dog 9 the amount of total circulating protein and albumin was markedly increased when the volume showed a precipitous fall. Also the fact that the rise in the plasma volume persists for weeks makes this theory unlikely. Thus the increase in the plasma volume must be largely due to a retention of either water or electrolytes or both.

Because of the findings in the present study and because of the increasing tendency to employ electrolyte solutions in the treatment of shock (2, 11, 5) it seems worth reconsidering the factors that influence the size of the plasma volume. In the normal individual it has been shown (17, 18) that the osmotic effect of the protein fraction is extremely important. The osmotic pressure exerted by the proteins especially albumin is largely responsible for the

reabsorption of water into the vascular system. In the healthy subject the protein is almost entirely confined to the vascular bed and to the intracellular space and there is approximate osmotic equality of the electrolytes within the cell, the interstitial space and the plasma. Thus a slightly higher solute concentration within the plasma and intracellular phase is maintained because of the presence of the protein molecules. It should be remembered however that the electrolytes are present in much greater amounts than protein and since the amount of water present in the body compartments is dependent on the total solute concentration (colloid and electrolytes) the electrolytes are much more important than are the colloid in determining the total amount of body water (20). In fact it has been stated by Van Slyke that the osmotic effect of the protein molecules is so slight when one is considering total body water that it can be almost neglected. It seems probable therefore that the alterations noted during the convalescent phase of these burned animals is largely governed by the fluid and electrolyte disturbances.

From other experiments (22, 32, 33) it is also evident that the size of the plasma volume in the diseased state is often not dependent on the plasma protein concentration. It should be recalled that the intraperitoneal injection of a solution of 5 per cent dextrose into normal dogs with the withdrawal of the same amount of fluid 4 hours later produces a marked increase in the plasma protein concentration but this even in the face of an adequate water and caloric intake will not restore the plasma volume if sufficient electrolytes are not present (2).

The importance of sodium was recently emphasized by Fine, Frank and Seligman who showed that the intravenous administration of a 1 per cent solution of albumin into an animal suffering from tourniquet shock was not of benefit unless a physiologic solution of sodium chloride was given by stomach tube or intravenously.

The work of Warren, Merrill and Stead (3) has also shown that a normal plasma volume may be obtained in shocked animals even when the protein concentration and total

circulating plasma protein is markedly diminished by increasing the extracellular fluid volume (tissue tension). Thus it is evident that the size of the plasma volume in disease is not dependent on the protein concentration alone but is governed by the following factors (1) the total solute concentration of the extracellular fluid volume and the available water (2) the osmotic pressure of the plasma minus the osmotic pressure of the interstitial fluid and (3) the blood filtration pressure minus tissue tension. Collier, Campbell, Vaughan, Job, and Moyer have pointed out that at certain times the kidneys are unable to excrete electrolytes and water in normal amounts and that the inability to excrete such products may lead to a marked retention of body fluid when the circulatory mechanisms aforementioned are not grossly abnormal.

Studies by Davidson on patients with severe burns showed that chloride was excreted in only small amounts. McIver re-emphasized this fact after having administered large amounts of a physiologic solution of sodium chloride. Trusler, Egbert, and Williams stressed the undesirable effects of large volumes of water in burned patients and experimentally were able to produce water intoxication by excessive administration. It has also been shown that a fall in the extracellular sodium concentration (9.23) causes an intracellular shift of water and since this condition and acidosis often exist during the shock and convalescent phases of a severe burn, it would not seem desirable to give large quantities of water nor a physiological solution of sodium chloride. Solutions with an electrolyte make up similar to that of plasma that would not upset the body's normal electrolyte pattern and would combat alterations in the acid-base balance would thus appear to be desirable during the period of shock. In the immediate postshock phase it would then seem advisable to give solutions and food that would have the mineral and food value needed especially for cellular repair and that at the same time would gradually help rid the body of any excess water.

CONCLUSIONS

1 Following the shock phase burned animals that were maintained on an intake of

food identical with that consumed before in jury show a decided rise in their plasma volumes above the normal.

2 Since a state of overhydration is manifested during the convalescent phase by the increase in the plasma volume and available (thiocyanate) fluid volume per kilogram of body weight it does not seem advisable to give excessive quantities of fluid during the postshock period. Such an overaccumulation of fluid may undoubtedly lead to some of the so-called toxic deaths. Adequate urinary output should be maintained and diuresis encouraged.

3 A marked increase in the total circulating plasma proteins was present although a marked negative nitrogen balance existed for 2 to 3 weeks.

4 A moderate decrease in the plasma albumin concentration and in the total circulating albumin occurred when the plasma volume increased.

5 A definite anemia was present in the convalescent phase because of an actual decrease in the circulating red cell mass.

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were in the patients with the most deficient proteins. They found that high caloric intake if low in protein had no effect on the healing of bed sores; there was continual weight loss and nitrogen balance remained negative. On the other hand a high protein diet resulted in a positive nitrogen balance and rapid healing of the ulcer. At this time I had a patient with a decubitus ulcer 4 centimeters in diameter which was enlarging in spite of very good nursing care. This man was then placed on a high protein diet (100 to 150 gm. protein per day) and in 12 days the ulcer was healed.

Distention and gas pains may be prevented or greatly lessened by the administration of adequate protein. In 1937 McCray Barden and Ravdin experimenting on animals noted that as serum proteins decreased in concentration gastric emptying time was delayed. Ravdin found that with marked hypoproteinemia it took three times as long for the food to pass through the stomach and the small bowel.

An important function of the plasma proteins, especially of the albumin, is to control the balance of fluid between the capillaries and the tissue spaces. While the figures are variable and depend somewhat upon other factors, in general edema is likely to appear when the plasma proteins are below 5.5 grams per 100 cubic centimeters or the albumin is below 3 grams per 100 cubic centimeters.

The globulin factor aid in the resistance to infection. Cannon Chase and Wissler (5) in 1943 demonstrated that the production of antibodies is only one fifth to one third as great in animals with protein deficits as it is when the proteins are normal. Cannon and Wissler with Woolridge and Benditt (6) found that normal human serum contains about 25 milligrams per 100 cubic centimeters of globulin; of this 8 milligrams or one third may be gamma globulin, and it is in this one third that antibodies are found.

Our study is based upon the use of protein digest (amigen) in 203 surgical patients from my private practice in the first 6 months of 1944. At two hospital amigen was given intravenously to most of the patients until they were able to take a soft diet by mouth. In another hospital I used no amigen but used

glucose and physiological saline instead as a control.

The eating habits of normal man are well established. He eats three meals a day and does not wait until he feels exhausted before consuming the next meal. It is no more logical to go several days after operation without adequate nourishment. It is even more hazardous since there is loss of blood and marked excessive breakdown of protein in the traumatized tissues. The postoperative lassitude and weakness have been attributed to the operation, however, may not the lack of nourishment be an important factor?

In a series of 32 appendectomy patients without peritonitis we gave amigen once or twice on the day of operation. The next day they were placed on soft diets. An average of 1328 cubic centimeters of amigen and 62 cubic centimeters of other intravenous fluids were given each patient. Forty-three liters of amigen were administered and 5 per cent of these caused reactions in 2 patients. One was a patient with acute appendicitis and severe nephrosis. The preoperative pulse was 160, marked anasarca and plasma protein was only 2.59 grams per 100 cubic centimeters. After the second infusion of amigen she was nauseated and vomited; this may have been due to the disease. She died of nephrosis 4 hours after operation. The other reaction was nausea without vomiting after the first infusion. There was no reaction after the second infusion. Routinely these patients sit up in 3 days and are dismissed in 5 days. They exhibit very little weakness.

Twenty-six hemorrhaphy patients were given an average of 038 cubic centimeters of amigen and of the 55 liters infused there was a distressing reaction in 2 per cent. One patient had nausea after the first of two infusions which was probably not due to the infusion as she was nauseated at different intervals during the same day.

An average of 365 cubic centimeters of amigen and 576 cubic centimeters of other intravenous fluid were given to 28 cholecystectomy patients. In a total of 61 liters of amigen there was reaction to 4 per cent. One liter of amigen is given twice a day until nausea has ceased and the patient is ready to take a soft

diet. These patients are much stronger and are convalescing much more rapidly. Most of them now sit up in 5 days and return home in 7. Of the 3 reactions there was a general malaise in a nervous patient in which the infusion was given in 2 hours and 30 minutes. Two had nausea. In the first it was given too rapidly 2 hours and 20 minutes the other probably was not due to the amigen as she was developing symptoms of a bowel obstruction for which she was again subjected to operation.

The pelvic operation group were treated the same as those with cholecystectomies and the results were similar. An average of 2,995 cubic centimeters of amigen, 139 cubic centimeters of blood and plasma and 65 cubic centimeters of other intravenous fluid were given to each patient. Of the 144 liters of amigen given there were distressing reactions in but 4 per cent. There were 5 reactions of nausea and 1 of headache and dizziness. Four of the six reactions were due to too rapid an administration of amigen 1 hour and 50 minutes to 2 hours and 30 minutes. These were all reactions to infusions given in the early part of this study. None had reactions with each infusion of amigen. One had reactions with one of the infusions received and the others in only one.

In a group of 17 thyroidectomy patients an average of 2,117 cubic centimeters of amigen and 1,64 cubic centimeters of other intravenous fluid were given. Of the 36 liters of amigen infused there were distressing reactions to 11 per cent. Two patients reported nausea and one patient had emesis after two separate infusions. These patients were all rather thyrotoxic.

Fifteen mastectomy patients were given an average of 1,66 cubic centimeters of amigen and 66 cubic centimeters of other intravenous fluid. Distressing reactions were reported after the use of 5 per cent of the 19 liters of amigen. Dizziness was reported by 1 patient; it was not given too rapidly and the patient was not otherwise distressed. These patients were placed on a soft diet within a short time after operation.

In a group consisting of 3 exploratory celiotomies, 2 liberations of adhesions, 1 gastroenterostomy, 2 leg amputations, 1 Kondoleon

operation for elephantiasis, an average of 22 cubic centimeters of amigen was given preoperatively to each patient. Postoperatively they received an average of 4,555 cubic centimeters of amigen, 22 cubic centimeters of blood and 777 cubic centimeters of other intravenous fluid. Of the exploratory celiotomies one was an inoperable carcinoma of the gall bladder, another carcinoma of the rectosigmoid and the third carcinoma of the ovary with liver metastases. There were 2 deaths in this group, the carcinoma of the gall bladder and 1 of the leg amputations. In spite of an average of 5 infusions per patient there were no reactions in this group.

In the following four series the favorable results of protein digest intravenously were quite marked because a longer time elapsed before the patients were able to resume eating. They were given amigen 1 liter twice a day until it was safe to begin mouth feedings. Their maintenance of strength and well being was outstanding and they did not develop edema. There was no need to give food by mouth until peritonitis had subsided and until bowel resections had quite healed.

In a group of 7 patients with peritonitis we gave an average of 6,326 cubic centimeters of amigen, 228 cubic centimeters of blood, 114 cubic centimeters of plasma and 1,259 cubic centimeters of other intravenous fluid. Protein is especially indicated in peritonitis as there is considerable protein loss into the peritoneal exudate. In spite of the severity of illness in these patients only two had reactions; one was an 11 year old boy who suffered chills but no fever and the other a reaction following the fifth of six infusions. This infusion was given too rapidly; we later discovered 2 hours and 30 minutes to be too short a period for satisfactory infusion. Of the 45 liters given there were distressing reactions to 4 per cent.

In acute intestinal obstruction amigen is usually given preoperatively as well as after surgery. Three patients with acute intestinal obstruction were given preoperatively an average of 2,333 cubic centimeters of amigen and 516 cubic centimeters of other intravenous fluid and postoperatively 8,666 cubic centimeters of amigen and 666 cubic centimeters of other intravenous fluid. Thirty three

liters were administered and there was distressing reaction in 3 per cent. One patient reported having a reaction of bad taste, nausea and emesis after an infusion. It is doubtful if it was due to the amigen as she was a very ill patient.

Ten patients upon whom gastric resections were done mainly for carcinomas and benign ulcers were given an average of 3,300 cubic centimeters of amigen, 50 cubic centimeters of blood and 1,400 cubic centimeters of other intravenous fluid preoperatively. Postoperatively they received 10,000 cubic centimeters of amigen, 150 cubic centimeters of blood and 1,200 cubic centimeters of other intravenous fluid. There were no reactions to any of the infusions in this group. About one half of the patients with carcinomas are hypoproteinemic as judged by the reports of Karl Meyer Memorial Hospital in New York (23) and the Brooklyn Cancer Institute ().

CANCER PATIENTS

TOTAL BLOOD PROTEINS—G PER 100 CC

No.	Diagnosis	Preoperative	Postoperative	Plasma protein below normal (g)
1	Bladder	6.4	5.8	
2	Brooklyn Cancer Institute	6.4	5.9	5
3	Abel	6.4	5.8	
4	Ovarian	5.7	6.0	
5	Gastric	5.7	5.8	7

Therefore we correct anemia by blood transfusion and protein deficiency by protein orally or intravenously before operation. This group progressed remarkably well with scarcely any complaints of weakness.

The colostomy group of 8 patients were mainly for carcinoma. It included obstructive resections of the sigmoid. In these the clamp is left on for 4 or 5 days until the risk of severe infection of the wound is reduced to a minimum. Preoperatively they were given an average of 6 cubic centimeters of blood and 50 cubic centimeters of other intravenous fluid postoperatively each received 10,000 cubic centimeters of amigen, 105 cubic centimeters of blood and 1,311 cubic centimeters of other intravenous fluid. Eighty

liters were administered with no distressing reaction. The patients' strength remained good and with gastric suction there was practically no distention.

In giving 730 liters of amigen intravenously to 203 surgical patients there were no severe reactions. Most of the reactions reported were in the early part of this study, 16 per cent occurring in the first 5 months when many of the infusions were given too rapidly. However there were reactions to only 3 per cent of the 730 infusions. If a 3 hour period is allowed for an infusion of 1,000 cubic centimeters of amigen we have little to fear from reactions.

A group of 50 patients were used as a control group during the time that we were making an investigation of the use of protein digest intravenously. They received glucose and physiological saline instead of amigen. They seemed to be weaker and slower in convalescing than those given protein digest.

It is realized that the conclusions drawn are based upon clinical impressions alone. Plasma protein determinations have been of no avail since definite changes do not occur within a span of a few days; consequently they are of value only in chronic deficits. Unfortunately there is no method of measuring the tissue protein and this is approximately thirty times as much as the plasma protein. Except for research purposes it is impractical to determine the total plasma volume roughly it is about one twentieth of the body weight. Therefore in an average 70 kilo man there is 1/20 of 70 kilograms or 3,500 grams of plasma. Plasma protein is normally 6.5 to 7.5 grams per 100 cubic centimeters. Taking an average of 7 per cent the total serum plasma is 245 times 3,500 grams which equals 857.5 grams. The total plasma volume is variable. For example it is greatly reduced in dehydration or shock and in such a state the total protein determination per 100 cubic centimeters may be considerably elevated but because of the decreased plasma volume the plasma protein in the total amount of blood may be decreased. It is possible to get an estimate of plasma volume by determining the erythrocyte count, hemoglobin and the specific gravity of the urine.

For a serum drop of 1 gram per 100 cubic centimeters the total drop in the plasma is approximately 35 grams. But as there is thirty times as much protein in the tissues we must assume that the protein loss from the body would be 30 times 35 grams or 1150 grams. This drop would require 2 or 3 weeks if no protein at all were given. It is evident why it requires so much protein to return a patient with a chronic deficit to normal.

CONCLUSIONS

The use of protein digest intravenously has been proved by various investigators to be safe and efficacious in promoting general well being and strength and as an invaluable aid in tissue building wound healing combating infection maintaining fluid balance osmotic pressure and optimal gastric emptying.

In our use of intravenous protein digest in 203 patients we found these results to be true we endorse its safety as a therapeutic measure. We advocate the intravenous use of protein digest following major surgery as a routine measure until such time as patients are able to take adequate nourishment by mouth or until proper assimilation is assured.

Our patients are clinically improved they are stronger display more pleasant cheerful attitudes and are able to be about sooner than those who are not given this treatment. They have a quicker return of appetite are more vigorous and ambitious in assuming accustomed activity and show much less fatigue.

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DISARTICULATION OF THE INNOMINATE BONE FOR MALIGNANT TUMORS OF THE PELVIC PARIETES AND UPPER THIGH

EVERETT D SUGARBAKER MD FACS d LAUREN V ACKERMAN MD
C I m b i M u

THE operative removal of varying portions of the pelvis along with the subjacent lower extremity has now been occasionally practiced for approximately 50 years. Though a number of terms (interilioabdominal amputation, interilioabdominal disarticulation, interpelviabdominal amputation, interpelviabdominal disarticulation, interiliosacropubic disarticulation, hindquarter amputation, hemipelvectomy, transiliac amputation) have been applied to operations of this general character, we have chosen the simple descriptive above because it most closely fits the cases to be presented and constitutes what in our opinion is the ideal procedure in the majority of instances.

The first attempt to accomplish such a removal is generally credited to Billroth, who in 1891 undertook to treat a sarcoma of the pelvis by this means. His patient died several hours postoperatively. Several other unsuccessful tries by Jaboulay and by Cacciopoli then followed, but in 1893, Girard resected a sarcoma of the upper femur carrying his line of division well up into the pelvis and was able to keep his patient alive postoperatively. A year earlier he had successfully removed a portion of the pelvis in another patient, but this was done for a stump recurrence of a sarcoma of the upper femur following an earlier hip joint disarticulation. Since then an increasing number of reports have been collected from time to time by various authors (1-18). In the most recent of these, Leighton collected 106 cases. The addition of 6 more, inclusive of the authors' cases, brings the total to 113. Of this group, 99 have been operated on for tumors of bone or soft parts in the region of the upper femur or pelvis

and it is with these that the present writing is concerned.

In evaluating any operative procedure for malignant neoplasms, two primary factors must always be taken into consideration: the primary operative mortality and the ability of the operation to cure. The factor of disability should also be considered in any operation as mutilating as this one, for there is no doubt that the disability is considerable. To date, no satisfactory prosthesis has been designed which will enable these patients to walk, and ambulation must be accomplished with the help of crutches.

Of the 99 cases listed, death occurred in 38 at the time of operation, a mortality rate of 38 per cent, and although the cause of death has not always been stated, it seems apparent that shock was responsible for the great majority, since death usually ensued either during or within a few hours of operation. With newer methods of treating this surgical complication, the mortality rate has dropped considerably. Prior to 1935, death occurred in 56 per cent of the recorded cases in the postoperative period, but in the past 10 years there have been only 6 postoperative deaths in the 41 patients operated upon, a mortality of 14 per cent. The average age of the group surviving operation was 35 years, as compared to 40 years in the group which succumbed, an additional reflection of shock as the major complication.

Attempt to evaluate the end results have been somewhat discouraging, as the length of follow-up in many instances has been inadequate to draw any useful conclusions. Of 61 patients surviving operation and followed up, 0 died of disease in 1 year, 2 up to 2 years, 1 each up to 3 and 5 to 6 years. Nine were clinically well up to 1 year, 6 up to 2 years,

2 up to 3 years and 4 from 5 to 9 years. Sixteen were not followed at all. Unfortunately of the 21 patients who were reported clinically well we do not know how many later died of disease though it is apparent that most of these patients died of disease within 1 year of operation and 12 of the patients had survived that period.

A variety of tumors were found in the 45 patients who were followed. There were 39 with tumors of the bone, 5 of the soft parts and 1 metastatic carcinoma (thyroid) who was alive 1 to 5 years later. Of the tumors of bone there were 15 osteogenic sarcomas, 2 of the patients living 1 to 5 years, 1 each of the osteoblastic and osteolytic types, periosteal chondrosarcomas 3 living 1 to 5 years and 4 dead within the 5 year period, 3 chondromas, 1 a postoperative recurrence and all living 1 to 5 years, 1 each of Ewing's sarcoma, benign giant cell tumor and neuroblastoma, each of the 2 latter living 1 to 5 years. Of the tumors of the soft parts, 3 were of muscle origin and 2 of these were well 1 to 5 years, 1 extraosseous osteogenic, 1 unidentified. It is interesting to note that 2 of the 19 osteogenic sarcomas were living. Undoubtedly the most favorable group consists of those in which the primary site of origin is in cartilage. It was difficult in some instances to determine accurately the existing pathology and the classification occasionally had to be made on the basis of inadequate data.

ANATOMICAL STRUCTURES CONCERNED

In severing one side of the pelvis the following structures must be divided: skin muscles—(1) flat muscles of the anterior abdominal wall, (2) rectus abdominis, (3) ischio-cavernosus, (4) quadratus lumborum, (5) iliopsoas, (6) gluteus maximus (sometimes saved), (7) pyriformis, (8) levator ani ligaments—(1) iliohumeral, (2) sacrospinous, (3) sacrotuberous vessels—external iliac artery and vein, deep epigastric, gluteal (unless the gluteus maximus muscle is to be spared), pudendal nerves—branches of lumbar plexus bone—symphysis pubis (or opposite pubic arch), sacroiliac joint (or sacral ala).

Structures to be carefully guarded are (1) ureter, (2) bladder, (3) rectum.

PROCEDURE

Our experience has been confined to the use of continual spinal anesthesia (5). The needle is placed in the third lumbar interspace and is included with the lower portion of the novocain tubing in the operative field so that it may be more closely guarded or replaced if necessary. Anesthesia is maintained at the level of the umbilicus. Transfusion is carried out throughout the entire procedure into the opposite upper extremity and small doses of pentothal are periodically given as needed to maintain light sleep. The patient is placed in an oblique position on the table and bolstered with sand bags. This position permits sufficient mobility for easy exposure both anteriorly and posteriorly.

An incision is made from the posterior superior iliac spine to the symphysis ending just above the iliac crest and Poupart's ligament. This incision gives access to the entire iliac fossa and vessels. The peritoneum is stripped away or the peritoneal cavity is entered if desired that it be left on the tumor or if for individual reasons it seems necessary to explore the peritoneal cavity at this point.

The external iliac vessels are next identified and the artery is securely ligated about 1.5 centimeters below the internal iliac. The leg is then elevated for several minutes in order to recover some of the blood contained in it following which the vein is ligated. The deep epigastric vessels are ligated and the pubic attachment of the rectus abdominis muscle is divided. The bladder is stripped away from the pubis, the penis is retracted toward the opposite side and the symphysis is divided either with a knife or by passing a Gigli saw behind it and cutting from within outward. The pubic attachment of the ischio-cavernosus muscle is divided close to the bone. Severe bleeding from the periprostatic and periurethral venous plexus may be encountered at this point. Exposure is usually inadequate at this point and the bleeding is best controlled by sponge packing until the specimen has been removed.

The skin incision is then continued from the posterior superior iliac spine in a downward lateral direction. The flap will be adequate if

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Examination of the s r g c a l p e c m n h o d
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The lesion was clas ified as an osteo eni
 sarcoma rather than a chondrosarcoma be
 cause neoplastic osteoid tissue and bone were
 evolving directly from sarcomatou stroma
 However because of the large amount of
 cartila e and its relatively well differentiated
 character as a whole this tumor has a better
 p r o m o s i s t h a n t h e o s t e o g e n i c s a r c o m a v h u c h
 is extremely cellular and vascular Grossly
 and micro copically the excision was adequate
 At the end of year the patient was without
 evidence of local recurrence or distant metas
 tase A postatectomy was necessary on
 December 6 94 The p r o m o s i s s h o u l d b e
 good n r e w o f t h e t i m e t h a t h a s e l a p s e d
 s i n c e o p e r a t i o n (F i 6)

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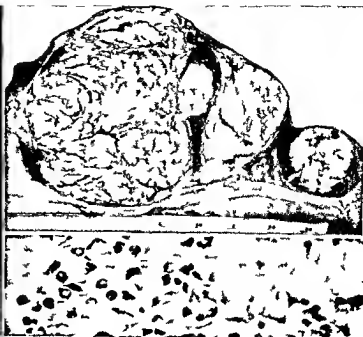


Fig 7 C Left P p t ph t ph d m
t t g soft t t m f t
Fig 8 right h C t f g p c m

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p l n e r l a g l y o b l t r a t e d g r a t l y a d i n g t
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l y m p h n l s o t h r i g h t b u t n t m r a p e n t
the l n g s o r b o

The differential diagnosis between a liposarcoma and a metastatic adenocarcinoma of bone originating in the kidney is at time difficult although liposarcomas rarely metastasize.



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Fg G ph t raph f k i y h m ll 9
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pel

size to the regional lymph nodes. Microscopically, they both may reveal large amounts of sudanophilic fat and glycogen. If multiple sections of the metastatic focus are taken and there are no papillary or glandular structures as in our case, the diagnosis is obscure. The primary kidney tumor may be so small as in this instance that pyelograms cannot determine the diagnosis. The most important finding in the microscopic appearance is the character of the individual cell. In the renal cell carcinoma, the nuclei are centrally located with well defined outlines and rather foamy vacuolated cytoplasm (Fig. 11a). Liposarcomas on the other hand invariably have some cells with eccentric nuclei which are compressed to a crescentic shape by the fat filled cytoplasm (Fig. 11b). The absence of the cell in this case plus the involved regional lymph nodes should have determined the biopsy diagnosis.

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Phy cal n t v al d b t m ll
b d b t ll p po t d fem l th m d

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upp th h a la m th th l
t s b t t t t ch d t t Th l g m d g
ce t m te at th p t f g t t c m f e
Th g l l m ph de r t n l d
N y m to l d l g ar f i
t f m th l ft f u th r h b t
d f m t ta t the l s Sm ll
t s e p t b th h m d d l
Th r l t l l t l th l r t d h d
th b w g f b th d al h ft B th l
n d bly t th th d t d t f d
f b th l had f i d t d e l p E t f th
f m t b f i b l d p l l p t
O p y th i t r f d t r p e t f t
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t h t d d t t h m d p t f th b f t
(F) Th h t t tum f t g p e d
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h e c p t f th f m me
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c p y n th f m t r h t p p th g h
R u t l b r t r y m t
m k a b l A b p y p m tak n S p t m b
h n d q u t n b l h d r m Th p t t
by l l t t h d d g t
g y t n l b f th p r t k b t
b c a f th p p d t p t t f t
th b p t l p t m b 8
At ch of th b q n t f l l p l t
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R t g g m h d f l p d c r t h
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433 (a b o t (a t) th t th f t t h a l l)
t d t g r y (F g 3) Sh t l l
l t l y g o o d b a l n d t l th h th
h a b b m k d g h t l 2 h tum w
t d d f m th p r a l p t t t b e



Fig 1. Photomicrograph of the tumor tissue showing the characteristic features of chondrosarcoma. The tumor cells are arranged in nests and cords, separated by a thin layer of connective tissue. The cells are large and pleomorphic, with hyperchromatic nuclei and prominent nucleoli. The cytoplasm is abundant and eosinophilic. The background is a pale, amorphous material, likely cartilage matrix.

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ppea a c d the t p nt d t ck
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lymph n d n l em t
N p c m n t o h d p ed m n tl
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n d an l v ns c inv l l n l the c c n
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In 28 cases of multiple exosto es reported by Lichtenstein 3 developed malignant change. He feels that probably the number of cases would have been higher if more time had been allowed to elapse. According to Lichtenstein's histologic criteria our case should be classified as questionably malignant. However if one takes into consideration the gross appearance, the clinical course and the fact that other cases have been known to develop distant metastases then a diagnosis of chondrosarcoma is justified. The peripheral chondrosarcoma has a much better prognosis than the one arising centrally. It tends to grow slowly remain localized for a long period of time recur if inadequately removed and finally to metastasize through the blood stream (23). The metastases are often only extension of the tumor into the large veins and have been known to pread all the way from the femoral vein to the pulmonary artery (17 30).

This case has been classified by some as multiple cartilaginous exostoses but is probably best designated as chondrodysplasia. The fundamental cause lies in the proliferation



Fig 2

F 3

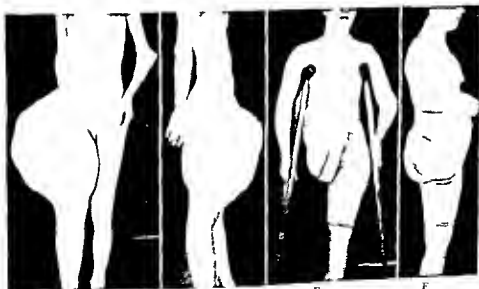


Fig 4

F 5

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F

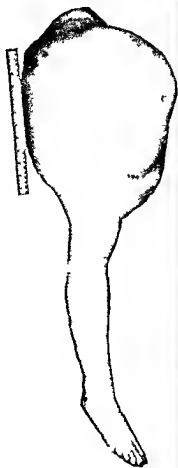


Fig 6

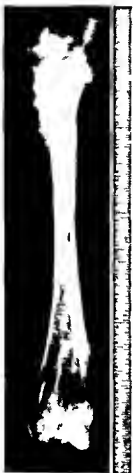


Fig 7



Fig 8



a



b

Fig 19

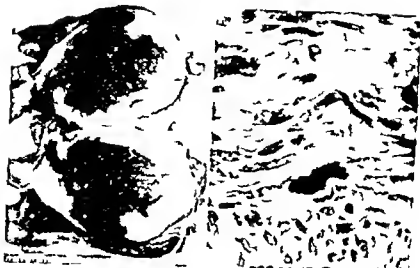


Fig. 1. C. C. 1 ft. G. os ph. t. gr. ph. of t. m. d. mo. t. u. g. ce. tral. h. m. r. h. ce. a. d. p. c. h. i. E. t. m. b. Ph. tom. raph. (h. h. po.) N. t. g. t. t. m. ll.

and ossification of bone forming cartilage. It is hereditary in nature, the proliferation and ossification of intermediate cartilage occurring during the period of skeletal growth (6-7-16).

This patient has gained 30 pounds since operation is in excellent general health and is able to use her crutches very well (Figs. 2-3). A prosthesis may be made. In view of the pathology and wide excision the prognosis appears excellent although it is possible that

malignant changes may develop in one of the other lesions.

CASE 5. W. H. L. EFSCH. No. 6 St. Th. p. t. e. t. a. 55. yea. ld. m. l. as. dm. t. t. d. t. th. h. p. tal. Ap. 12. 944. P. th. h. t. g. p. t. ll. l. ed. by. ll. v. f. th. th. h. on. the. h. p. as. best. n. t. e. d. 6. ls. b. f. The. as. also. c. s. ngly. severe. p. ad. t. d. the. po. t. f. f. th. th. gh. d. c. m. f. t. f. The. was. no. h. st. ry. of. t. u. m. p. s. treatment. h. t. lo.

Phy. cal. am. n. t. n. al. d. ll. d. el. p. d. ll. no. hed. mal. wh. s. h. t. th. h. f. red. t. th. hip. The. m. k. d. m. l. g. a. l. the. right. l. c. f. a. d. l. f. m. m. q. est. bl. tt. h. l. t. th. l. m. ld. b. l. l. t. Ba. uen. e. m. al. d. t. c. p. es. u. l. f. t. f. th. um. at. th. l. l. f. th. l. c. c. i. ln. t. en. f. yel. graphy. ho. d. mes. ld. pl. c. m. t. f. th. h. t. md. te. Th. h. t. pl. t. Ga. t. Ap. r. t. a. b. p. y. f. th. ma. sh. d. u. cl. u. d. c. m. A. th. r. wa. n. d. ce. f. d. t. nt. m. t. t. a. ex. pl. rat. ry. p. ti. w. d. Th. b. an. t. abo. the. po. t. n. p. p. f. th. r. ht. l. m. a. d. e. ry. d. nl. l. a. s. m. t. ll. p. r. all. l. to. th. c. t. f. th. l. m. d. n. P. p. t. s. ligam. t. nd. th. p. nt. m. r. i. a. l. n. ly. bo. th. ma. b. m. l. it. es. f. th. abd. m. n. l. t. t. e. ot. d. Al. g. rubb. ry. m. s. c. rup. g. th. pp. p. rt. f. th. g. f. th. l. m. d. t. nd. go. pal. th. p. a. lm. l. e. n. with. th. att. chm. t. t. th. lra. r. p. es. es. f. th. lumba. et. bra. a. f. t. t. p. nt. n. ll. M. d. all. th. m. t. d. d. l. t. th. lo. e. lumbar. crteb. s. al. la. g. es. ls.



Fig. 3. P. t. perat. ray film.

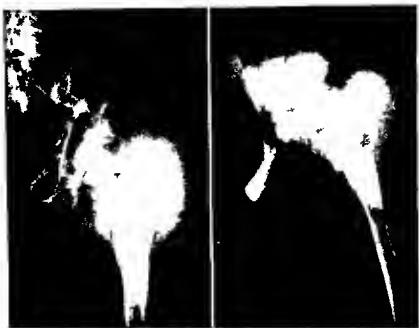


Fig 4 C 6 L ft P e p t y film sb g t m d i f f t u r
l g 5 N y film f p e c m

et el t Th prito m d l to the m ss vas
i sel i r ut ed t the p ito e m ter ly
th s l g th ca ty l i g d s t u b d the
p it u m dir tly erly g th a The e
t r n a l a c s s l p a t l l v s r n d e d b u t n t s
f i l t r a t e d b y t m o r A l t h o u g h t h g h t u t s
d s p l c e d i t a p p e a r e d t b e i n l i v e d A j t h g
h r t o f d e r d c a l e m o v a l u l d b u l s s r e s u l t
a e c e c u n d t h e t e l i l c v e l s a d
a c c d g l y d a t c l t i f t h e o m n a t b o
s r d t Th p e c m e n c o s t e d f t h g h t
h d q u a t e Th y m p h y s p b h d b h u d d
t h m d l n i t h c r t m j t m d l t o t b
l j t Th e r d d f t m h t
c y t c m m s u g s b y b y o c e t m t r s
n c o r a t e l t h p s m u s l e s b t l y g f o t b
m s t p a t n t h l c f o a e t n l s c e t m t r s
b o i t Th p s m l e s t h n e d t a d
u u d l t h t m r m a O s e c t n a c t l b
n l m n t s b t Th t u m r a f t y l
l h g v a c l a d a f h m h g
r s e n t l t p p n t l y f m t h e l i p s
m s c l (F g a) The d h w e l o g r
d e c f t u m r
M i c o c p l l y t h t u m d f f e n t a t d
a n d h e d a p p r t t r a n t o f i m m c l C r s
t r i t o s e u l d n t b d e f t l y d m t r a t d b t
t h y o f t n t p e t Th r e e m a y
m t t c f i g u d b z a g t f m s p t (F
22b) R l o t t s t h l a g l l e a l a y s s
u d f f e n t e d f i r m o f h b i m y s a r c o m
Th p o s t p e r a t u e s u e n t l f o 6
d 3 s (F g 23) w h e n t h p a t e t c o m p l e d o f s o m e

l w r r i g h t c h e s t p n Th r a s n h e m p t y s i s
n d t g e g r a m f t h e c h t v a o t r m a r k a b l e
t h g h t y m p t o m s g g e t e d a m a l l p l m o n a y
e m b o l u s T h e p a t i e t d i e d s u d d e n l y t h e n e x t d a y
i t h y m p t m e c p d i n g t o a l a r g e p u l m o a r y
e m b o l u s P e r m s i o f o r p o s t m r t m e m n a t o
s n t g r a t d

The location of this tumor the gross appearance apparent origin from muscle and the microscopic findings all substantiated the diagnosis of rhabdomyosarcoma If the patient had recovered from the operation pulmonary metastases or local recurrences would probably have developed within a year

CASE 6 J G EFSCH No 7018 A 55 year ld m l v a a d m i t t e d t t h e h o p i t a l n D e m b e
044 F o u y e a r s b e f o e t h e p t e t s u f f I s e v e
t a m a t t h l f t t h g h T h s t o f i n j u y a
p a n f l f s e v a l l y b u t t h e r e w e o f u r t h e
s y m p t m u n t l N e m b e r 1943 v h a d u l l a c h
i g p r s t n t p i t e x a g e a t e d i t h m t i l t y
s t r e l t b u p p r p o t o n o f t h e l e f t h p I M a y
044 h e t u r n d b u s l e f t l g w t h a c a c k i n g s o u n d
f l l t o t h g r d u b l e t o m o v e t h l e g a n d s
t k e n t o a l o c a l h s p t l S h o r t l y t h r e a f t e a l a r g
m a s d e l o p e d i n t h e l e f t t h g h a n d h e a s e f e r d
t t b s h p i t a l f o r t r e a t m e n t
P h y s i c a l e m a t i o n s h o e d a w e l l d e l o p d
f h y e l l n o u r s h e d m a l e I n t h e l e f t u p p t h g h
t h e r a s a f s f m m s s m e a s u n g 65 c e n t i m e t r

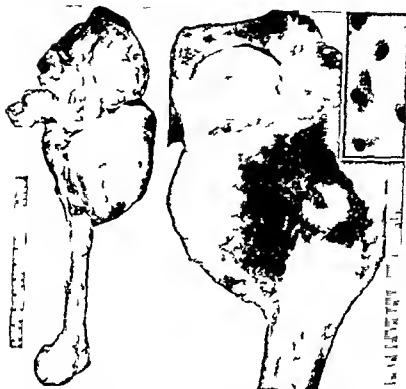


Fig. 6. Left. G. os. ph. t. g. ph. f. pec. m.
Fig. 7. Right. G. ph. t. g. ph. f. pec. m. cut. se. tu. d. m. t. tu. g.
f. h. h. g. g. l. t. h. t. l. t. m. f. f. t. d. t. f. t. m.
t. d. l. y. b. l. l. h. l. g. ph. (f. gh. po.) d. m. t. t. g. pl. mp.
l. l. t. pl. l.

it g t t c uml encc Th k as t
d h ny but m l m thiv o th f m u le
l ng gg t ly cyst c m A f up fici l
ve p nt

Lab r t ry m t h d ly l h t e
d y a ma Th ed d alk l ph ph ta
r rml y m t h d d tru
t e b l th f ct f t cl f th
left f mu (Fig. 4) Th l rge f t u
md f v y g d n t th a R cntg n
gram f th ch t h d d n e f m ta
t e

S alp p r t t a f g nd
De mb 4 d t c l t n f th l f t
at b a f f m d th t d nt The
po t p t e f l pt f

it t l f app m t ly q
che f th fl p
l th l l m n t h d lag t m
pl g th pp th d f th f m (Fig. 25) nd
6) ft t l d t t th f t c th
b n f t d c t d d d t th
ppe th d f th m d l l y po t n f th h ft
(Fig. 25) Th t m r a q t f t m d p r

t ll t a d e t d m ll p e s of bo
The s go n l m t f v s g l
lymph od s o t b l m Th u d
m les h d p t f pl m t
M c p am at h ed d
n a lymph d m t t Th t m
t lag th d d l ca t l g c ll ft
h g pl mp cl m l up l n l d m t t
fig (Fig. 7b) Th t m f g th
t m c t l of f l y a l t n t t
h g n d e f com t ch g A f
p ul of b n r p e s

Thus tumor grew slowly for at least 3 years and examination showed apparently complete removal. Because it was a hemorrhagic cornua probably arising centrally the child would be a good specimen although the possibility of venous invasion (although not in our histological) always possible. This again shows the importance of the pathological pattern in determining the ultimate prognosis.

RECAPITULATION

As a life saving measure transection through or above the innominate bone appears to be a very effective procedure in handling sarcomas of the pelvic parietes and upper thigh. The mortality rate of 14 per cent for the past 10 years as compared with 56 per cent for the preceding 40 year is very encouraging. That only 99 operations of this sort have been reported during a 50 year period is clear indication however that only a very few of these cases are being given the benefit of radical surgical removal. A glance at the tables in the book by Geschickter and Copeland confirms this since none of their patients was treated in this manner.

A comparison of our own experience with that of others would indicate that a disproportionately large number of younger patients have been selected for operation. Of the 93 cases reported exclusive of our own only 11 were over the age of 50 and only 2 were over 60. Since Fitzwilliams case represents the only one (besides the authors') over 60 years surviving operation there might have been some justification for such selection in the past. It should be recalled however that a high percentage of osteolytic sarcomas of bone in which the prognosis is extremely poor will be found among the younger group. With the decrease in operative mortality it would seem reasonable to select patients in the future less on the basis of age and more on the basis of the pathology of the tumor.

It is apparent that the benign tumors such as the neurofibromas, benign giant cell tumors, giant osteochondromas and chondromas may be expected to present the best prognosis. The next most favorable group will be the chondrosarcomas arising either peripherally or centrally. The peripheral group arising usually from cartilaginous exostoses will offer the better outlook. Well differentiated soft tissue sarcomas of long duration should be operated upon although the prognosis will be less favorable. Osteogenic sarcomas forming large amount of adult cartilage (Case 1) should certainly have the benefit of operation. This is also true of osteolytic osteogenic sarcomas and very undifferentiated soft tissue sarcomas although among these

the salvage will be very low. Ewing's sarcomas, plasma cell myelomas and metastatic tumors if recognized as such should probably not be subjected to such an operation except under unusual circumstances.

Examination of the surviving patients reveals that in certain instances even more radical treatment is necessary if the results are to be improved. There is no known surgical means of coping with subclinical metastases and many patients presenting these tumors will undoubtedly die of distant spread subsequent to resection as is already known to be true of histologically similar tumors situated peripherally in sites amenable to the commoner types of amputation. On the other hand it is frequently within the surgeon's means to prevent local recurrence as it is a well known tendency for many of these sarcomas unless widely removed to recur stubbornly. Obviously one of the distinct advantages of operations of this sort for tumors in the upper thigh and lower pelvis is the wide removal permitted. Yet of 45 patients followed 8 developed stump recurrences. The first case a chondrosarcoma of the lower innominate bone with incomplete section above had a recurrence 17 months after operation. The second case had a chondrosarcoma of the ileum with section through the notch and there was a recurrence in $5\frac{1}{2}$ years. In the third case a chondrosarcoma of the ileum the gluteus maximus was preserved recurrence 1 month later. In the fourth case a chondrosarcoma of the ileum there was a recurrence in 2 years. In the fifth case an osteochondrosarcoma of the acetabular region section was through the notch recurrence 12 months later. In the sixth case a myxochondrosarcoma of the upper femur an effort was made to save the adductor muscles recurrence 6 months later. In the seventh case a benign recurrent chondroma of the ileum there was recurrence 4 years after operation. In the eighth case a spindle cell sarcoma of the upper thigh section was through the sciatic notch recurrence 5 months later. Probably not all of these were avoidable but it is significant that in 4 of these the innominate bone was completely removed although it represented the site of involvement in 3. In 1 instance the

gluteus maximus muscle was preserved when the tumor was situated in the adjacent and attached ilium. In still another case with tumor in the upper femur attention was focused on the preservation of a long medial skin flap with the underlying retractor thigh muscle and the obturator artery. Six of the eight recurring cases were chondromatous tumors of bone and 2 were soft part spindle cell tumors. In our first case in recognition of the tendency which bone sarcomas have for crossing joints the entire innominate bone was removed together with a generous segment of the opposite pelvis as well as the ala of the sacrum. In Case 4 the gluteus maximus muscle was removed in order to maintain an additional zone of safety between the disease and the line of section. Both of these patients remain well. Experience to date therefore indicates that fuller advantage of the procedure should be taken in making it as radical as the tumor demand and the anatomy permits. It is firmly believed that when this is done the end results will be considerably improved.

SUMMARY

1 Fifty years have elapsed since Girard first successfully resected a portion of the pelvis along with the lower extremity for a sarcoma of the upper femur which would not lend itself to disarticulation at the hip joint.

2 Similar procedures have now been reported for malignant tumors of the upper femur innominate bone and adjacent soft parts in 99 patients.

3 Although an overall mortality of 8 per cent exists that of the first 40 year period was 56 per cent but during the past 10 years it has dropped to 4 per cent. This drop has been largely due to development in the treatment of shock which has been the primary complication of this operation.

4 Follow up data although woefully inadequate indicates that of 43 patients surviving operation and followed for one to or more years remained clinically well and 4 died of the disease.

5 The deformity although considerable is borne gratefully by these patients who have usually become convinced that the disease remains no hope of cure.

6 The anatomy operative procedure and variations in technique are discussed.

7 Six unselected cases are given all with at least a removal of entire innominate bone.

8 In criticism of the past treatment it may be said that far too few patients have received the benefit of radical operation that the advantages of wide resection have not been sufficiently exploited particularly as regards partial or incomplete removal of the innominate bone when that bone itself represents the site of the tumor that with more adequate control of the mortality patients be selected less on the basis of age and more on the basis of the pathology of the tumor. It is believed that consideration of these factors in the future will favorably influence the prognosis in sarcomas of the upper thigh and pelvic parietes.

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E D S g r y 944 6 886
6 E R R A J A J A m M A 9 64 64
7 I d m J A m M A s s 9 7 68 5
8 F o v A h i l h 9 36
9 F I T L A D C L P o c R S o c M L d 938
3 548
G m c C F d C A D M M T u m r s
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G O R D O T G d W L E I B t J S
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3 J L M L y med S o t 7 7
4 J A D M C B t M J 9 9 379
5 J I D S S S g G y n O b s t 9 6 43 664
6 K A J A t L d 9 4
7 K M A h h A r h 9 9 7 66
8 L H T W F A h s 93 45 9 3 d l
9 L H E R d P L A R A L F b l O s P
P h y s i c N m l t P t h l g i q d l O s P
M s o t C 9 6
L L L d J H L A m J P h
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M T B A m J P t h 33
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P A L J H B t J S r 9 6 4 33
4 R A I A m J C a 937 3 4
S a r W R h P 90 6 35
6 S I E A R F W A m J P t h 93 87
S T R O T A P F r s o l m m u t u
9 A R C H E R R v h A h 834 97 4
W A R R E S A m J P t h 93 7 6
3 W I L L I A M E R B t J R d i l 34 7 4
3 W I L S O H A m S g 94 3 9

PARACHUTE FRACTURES

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A SURVEY of fractures which occurred in a regiment of paratroop infantry during a 6 month period of intensive training is presented. The injuries sustained in jump training at Fort Benning have been covered by Tobin (2), Lord (1) and Tobin (3). The altitude of the area over which jumps reported in the present study were made is approximately 4,000 feet in marked contrast to the training area at Fort Benning, Georgia, 300 feet above sea level.

The over all incidence of casualties was as high as 10 per cent in some of the jumps at the beginning of training. A casualty was defined as absence of soldier from duty for 24 hours or longer. The number of accidents was rapidly reduced until at the end of the period of training the casualty rate was less than 1 per cent.

The optimum speed of the airplane during release of parachutists is about 100 miles per hour for a static line jump. The pilots had difficulty slowing to that speed in the C-47 Transport at the beginning of training owing to the relatively low density of the atmosphere over the training area. (Mean barometric pressure about 600 millimeters of mercury against 760 millimeters at sea level). The jumps were made at 800 feet above ground level in the beginning of training gradually dropping to 600 feet as the program went on.

The impact at which the parachutist hits the ground is equal to that of a fall from a height of 10 to 15 feet. If the ground is at an altitude of 4,000 feet the impact is equal to that of a fall from 15 to 20 feet.

A wind of over 12 to 15 miles per hour greatly increases the number of casualties. In the area where these jumps are made the standard saying is: "If you do not like the wind or weather wait 30 minutes and it will change." Consequently jumps were occasionally made in wind velocities as high as 35 to 40 miles per hour. In practice maneuvers with other airborne troops the jump had to be made as scheduled thus causing some jumps to be made during inclement weather.

Psychoneuroses including hysterical states and malingering were very uncommon in paratroopers. Practically no cases were seen in officers. A few occurred in enlisted men toward the end of training when the outfit was very hot. Most of these were traumatic neuroses involving back pain following a jump and were completely refractory to treatment of any kind physical or psychiatric.

Back injuries were not common. There were 7 cases of compression fractures of the vertebrae. None was complicated by paralysis. There was not a single case of protruded intervertebral disc found during this period of training. Back sprains of any severity were uncommon as the men were taught to land on their feet and roll forward. The 7 cases of compression fracture were all associated with one of two complications: the primary chute did not open and the secondary chute was used or another parachutist accidentally emptied part of the air from the chute which carried the man who was injured. There were no compound fractures and no fatal accidents.

The head injuries included two (2) linear fractures and four (4) of the basilar type. The injuries all happened in a high wind which caused the parachutist to land sideways striking the head in some manner. All recovered but 2 of them were permanently removed from jump status because of post-traumatic symptoms. Encephalograms revealed no evidence of gross damage to the brain. I am unable to state if they were instances of traumatic neurosis or permanent cerebral damage. None of the patients was subjected to surgery.

Acromioclavicular separations were not common. Injuries to the acromioclavicular joint were treated by depression of the clavicle and immobilization. Separation of the coracoid and trapezoid ligaments was repaired by open operation. The technique of Bunnell using fascia lata was employed. There were 4 of these cases. Satisfactory result was obtained and all returned to jumping after 4 months.



Fig 1 ft R t fthel t lp fth ghtlt
lg S m f t lg b t 3 dy lt
h gh l g f pot l p f t



Fig 3 lft F t f p t lp fth th t
d pl t pl t h t 3 dy lt



Following is a list of the types and numbers of fractures skull 6 nose 4 maxilla 2 humerus 3 radius 4 navicular (carpal) 3 metacarpals 6 phalanx 7 rib 4 compression of vertebrae 7 sacrum 1 coccyx 1 femur 1 patella 2 tibia 22 trimalleolar 6 fibula distal portion 29 astragalus 1 os calcis 3 cuboid 2 tarsal 2 metatarsal 7 toes 4 a total of lower extremities of 79 and a grand total of 129

Fracture of the posterior lip of the tibia is so typical a parachute injury that it has been named paratrooper fracture by Tobin (3). This fracture is uncommon other than in parachute injuries and for that reason has received a small amount of attention in the literature of traumatic surgery.

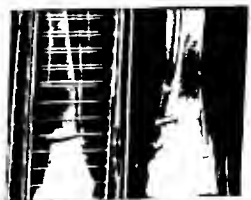
Parachutists are taught to land on the ball of the foot. This is possible if there is no wind

and the terrain is even but too often this is not the situation. These fractures occur when the weight of the body is transmitted through one foot instead of being divided. The excellent type of boot worn by the parachutist prevents the fracture from being more frequent because it distributes the transmitted force through the lower leg.

The anatomy of the ankle joint further explains the fracture. The posterior lip of the tibia is lower than the anterior so that the joint mortise is wider anteriorly than posteriorly. The external and internal malleoli keep the astragalus in line and a transmitted force must shear off the posterior lip preferentially. The posterior one fourth of the joint



Fig 5 Excess l f p t t ed l h kl
d t mm bulged P t t h d p l l h kl
j t



F 6 lft S t m lleol f t f kl h
f t b h l t gam t
F A t t h g t l m l l
th sc d h b la axed h t h sc
j pa m l

surface is most commonly involved. Separation of fragments is rare. Open operation has never been necessary in my experience in fracture of posterior lip from parachute injury.

This history is typical of the parachutist who lands on one foot in uneven terrain or due to oscillations from a high wind with immediate pain in the ankle joint and great difficulty in walking. In all such fractures which occurred at this Station not one was missed in the field. By this I mean they were sent into the hospital immediately and demonstrated by lateral x-ray films. This justifies the term "paratrooper fracture" because it is so often diagnosed accurately by field medical units.

A method of treatment was established which I would like to describe in detail. (1) A padded plaster cast is applied from the base of the toes to the tibial tuberosity. (2) The foot is placed in the neutral position. (No inversion or eversion) i.e. a line through patella would go between great toe and second toe. (3) The ankle is placed in exactly 90 degrees dorsiflexion. (4) An anesthetic may be necessary to get the ankle in proper position. (5) The patient is kept on absolute bed rest for 1 week with elevation of the extremity on two pillows. (6) After 1 week, the cast is removed and replaced by another cast with a very small amount of padding. A section of wool felt 2 by 2 inches is placed dorsally over the tarsal bones. (7) After 48 hours the patient is allowed to walk on the leg. No crutches or walking calipers are employed. The cast will frequently break on the bottom but good support is given to the ankle nevertheless. (8) The cast is removed after 2 weeks and daily whirlpool baths of 30 minutes in the morning and infra red treatment for 1 hour in the afternoon are given. One week of this treatment will suffice ordinarily and the parachutist is ready for full duty including marches. There will be no circulatory changes in soft tissue or bone, no swelling of the ankle at night and no restriction of motion.

CASE 1 Patient was injured in a parachute jump when he landed on his right ankle. There was immediate pain in the ankle joint and great difficulty in walking. The patient was sent to the hospital immediately and demonstrated by lateral x-ray films. This justifies the term "paratrooper fracture" because it is so often diagnosed accurately by field medical units.

The foot was kept in a plaster cast and patient was in hospital 30 days.

CASE 2 Patient injured in a parachute jump when he landed on his right ankle. There was immediate pain in the ankle joint and great difficulty in walking. The patient was sent to the hospital immediately and demonstrated by lateral x-ray films. This justifies the term "paratrooper fracture" because it is so often diagnosed accurately by field medical units.

CASE 3 Patient injured in a parachute jump when he landed on his right ankle. There was immediate pain in the ankle joint and great difficulty in walking. The patient was sent to the hospital immediately and demonstrated by lateral x-ray films. This justifies the term "paratrooper fracture" because it is so often diagnosed accurately by field medical units.

CASE 4 Patient injured in a parachute jump when he landed on his right ankle. There was immediate pain in the ankle joint and great difficulty in walking. The patient was sent to the hospital immediately and demonstrated by lateral x-ray films. This justifies the term "paratrooper fracture" because it is so often diagnosed accurately by field medical units.

Case 1 shows the ideal result when the aforementioned routine is carried out.

Case 2 demonstrates an increased length of time when the ankle is not immobilized at exactly 90 degrees.

Case 3 shows the permanent disability that may occur in an ankle if the fracture is not recognized primarily and properly treated.

Case 4 shows a severe type of fracture and the good result obtained from open operation.

CONCLUSION

1. A review of the number and type of fractures encountered in parachute training of a regiment at a relatively high altitude is presented with a brief discussion of the cause of such injuries.

2. Typical case histories of paratrooper fracture are outlined.

3. A detailed method of treatment of paratrooper fracture is given.

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opening up of the perirectal space by finger dissection the best possible drainage is acquired. To avoid turning the patient the lithotomy position with a sandbag under the sacrum should be used for excision of the coccyx. A wound near the lateral border of the sacrum may be extended vertically along the side of the coccyx and sacrum good access to the perirectal connective tissue plane is thus obtained.

There is never need to destroy the sphincter mechanism by division of the anorectal musculature but dilatation of the anus and the insertion of a large tube at the end of the operation will aid drainage.

During convalescence if the perirectal space has not been drained and there are signs of spread of infection no time should be lost in opening up this area.

With bursting or explosive injuries because of the time lag extensive soiling etc. it is usually unwise to attempt reposition of the retracted bowel. When this has been done sutures have usually cut out and what is more serious drainage has been inadequate sepsis is kept up by pocketing under skin flaps etc. In one such case the patient improved only after pocketing under bridges of skin and extension of sepsis into the buttocks were treated by laying open widely the whole area. The speed with which the perianal wound healed and the patient improved was a tonishing. The anal canal will function normally whatever its position if its nerve and muscle control has been preserved. Wide excision of the perianal musculature is usually unnecessary and should be avoided.

Foreign bodies encroaching on the sacral canal should be treated with caution and caution since there is a definite risk of meningitis. One such patient arrived at the Base with established meningitis. He responded to sulfapyridine the metallic foreign body was removed 4 weeks later the patient having sulfapyridine before and after operation. In this series removal of a foreign body on the 8th day was followed 10 days later by death from meningitis.

Intaperitoneal wounds. When an abdominal lesion has been diagnosed exploration of the entry or exit wound should be deferred

until the abdomen has been opened and the pelvis examined. It may be possible to suture an intraperitoneal tear or if this cannot be done the damaged area may be shut off from the general peritoneal cavity by means of the omentum or a Coffey drain. A catheter is placed down to the site of injury a colostomy established and the abdomen closed. A suspension of 10 grams of sulfadiazine in 50 cubic centimeters of a solution of gelatine and saline (10% gelatine in normal saline) is injected down the catheter. The wound of entry exit or both are then trimmed and enlarged for drainage turning the patient should be avoided if possible. The wicks of the Coffey drain are removed piecemeal after the 3d day.

Colostomy. The most desirable site for a colostomy is as near the rectal lesion as possible i.e. a sigmoid colostomy with a food spur. If a plastic repair operation is considered likely in the future it is best to leave a good loop of colon below the temporary colostomy. In cases of urgency the colostomy may be performed through the exploratory incision. For an extensive wound of the pelvirectal region with a short sigmoid loop a transverse colostomy will make future operation on this portion of the gut easier. It must always be remembered however that the prime object of the operation is to save life.

Repair of rectal perforations. This problem will not be faced as a rule for several months after wounding. Continued infection especially from osteomyelitis will prevent plastic operation but it is important during this waiting period always to assure free drainage and complete exclusion of the rectum by means of a satisfactory colostomy.

Unless there has been extensive tearing of the gut intraperitoneal wounds will probably finally close themselves the difficult cases are those extraperitoneal wounds which are in the rectum under cover of the sacrum especially with a fistula passing through the bone. The internal opening of these fistulas is usually obscured by a shelf of mucosa and the rectal wall is firmly adherent to the sacrum.

Daily injection into the distal loop of the colostomy of a freshly made 20 per cent suspension of sulfasuxidine in water (pH 7) is useful in controlling infection.

Penicillin will undoubtedly help in the closure of these fistulas. In the case of one patient with a large tear in the posterior wall of the lower third of the rectum early repair was attempted followed by the use of penicillin locally.

64043 2 Cpl BR had pe f tung m tar nd if the back nd buttock Operat asd ne 14 ho after wound g— trv nd jut to left of thrd l mbar erteb e t wou d l f b t t ck. A larg ectal tear w palp ble digital amna tio f th rect m T let of you d —left g inal c l tomy—n ntra hd minalcontamin ton P t perat ve t atm nt c ns st d ol admn str ton of ant g s g es uma d a f l l co of sulf a m de Cont uo ntrav o gluc sal e was al o d m n t red

Hea r d at th B 3 eeks l t i g o l c d t on Th re w a mall healing e t y ou d n the l f t l mba reg on a d s m e f l l ss of the left butt ck v ith an t o d d charg g th p Cr pit t n co ld be felt und the k Th as l m h d sen at n n the ole f the l l l loot th d m u t on f th nkl ye k and ray e am to sh ed c mm ut of the l f t s d ol th 2d 3d nd 4th p ces f th sa um n l g th foram Thel c lost my loop w s w sh d thr gh d ily th i fia ne but perato w e ary f t atm nt f th sa ral oste my l t s

Ope t n w s done 26 d ys fter w und g The buttock o d wh h l d t bar bon was c s d rably e l r g d nd th t ck f th m s l w l id pe by d v d g the att chme t f th glueus ma mu f om th coc v and la t t o p c of th um the ccy w s e c sed Ther w a h l v r i ches l g a d a b o t s nch le th l i t d f the post i ect l w l l Th t m t g the vith ts fa cia pr pia vas m b l d uf f ic n tly nd aft the eds f th ect l d lect e e f h d th w c l ed by n e t g s t r e f c d by Lembe t suture n th l cia A cath te pl ced i fr nt f the cr m p to th acral f t e t a d th k wa mplet ly sutur d pa t f o m a e t f th cath t l r p to f th b t t ck Th w nd r gat d the i m d aly ith 500 ts of Fl ey p ell th o gh th cath t

Th t e l the ct m bok do pa tally d pu d chag d f m the t m a d l t m y th p t s g l d t x l l t d th k h a d dly—he h d b l d nte al f i t u l Tw m th f t p t d a n g e f o t o m y l t f th c m nd que t ct m y we c c s a r y F i t d y l t th e a a t i y s p r f i c l w o n d o the m w h h h l g r p dly Pen c l l n h d m de pos bl e n n the p e c f t e myel t f th c um th n e r s f a l g e t r a l ectal f i t l a n t a s m l l ne f th b l n d n t e r n l t y p e

ANALYSIS OF CASES

In a series of 32 penetrating wounds of the rectum there were 26 extraperitoneal lesions and 6 intraperitoneal or combined. Since most of these patients were seen at the Base it seems that either intraperitoneal injury is less common or more likely extraperitoneal damage to the rectum is less dangerous. Rapidly fatal acute infection occurred in both types of wound.

Extraperitoneal Wounds

Of the group of 26 extraperitoneal wounds there were 5 of the anorectal region complicating wounds of the buttock or perineum. In 3 the anorectal area was torn while in the injury was mainly of the bursting type of injury of the perineum with retraction of the anal canal. The 3 patients with avulsion of the anorectal region were treated by colostomy and drainage. In 2 the colostomy had been postponed for 3 days, 1 of these died of gross infection of the wound. The 2 bursting injuries were also treated by colostomy and by reposition and suture of the retracted anus. In both cases the sutures gave way though in 1 case the right side of the anus remained in position. During convalescence the provision of free drainage necessitated wide division of the skin and the laying open of all subsidiary pockets in 1 case. In 3 of the 5 cases fracture of the bony pelvis (ischium, pubis and coccyx) complicated the anorectal wounds and in 1 case the extrapelvic urethra was injured.

There were 21 wounds of the rectum and the site of entry was as follows: buttock 11, sacrum 7, groin 1, hips 1, buttock and groin 1. The diagnosis of injury of the rectum was not made in 7 cases (one third) until feces or flatus were passed through the entry wound 4 to 6 days after the wounds were received. In 1 case with associated bladder injury the poor condition of the patient suggested injury to the rectum on the second day. Five of the 7 undiagnosed cases were treated by late colostomy. Two died, 1 with associated bladder injury, the other from meningitis following removal of a foreign body from the sacral canal on the 8th day.

Injury to the rectum was diagnosed in the remaining 14 cases (two thirds) as follows:

blood per rectum on examining finger 2 extensive sacral wounds with fracture 2 feces in the entry wound 2 tear palpable 2 blood per rectum and palpable tear 1 tear visible 1 exploratory laparotomy—marked extra peritoneal hemorrhage spreading into meso sigmoid 1 no record 3

The time lag in the cases of wounds of the rectum was recorded in only 11 of the diagnosed cases within 12 hours there were 5 cases and of these 1 died of hemorrhage and shock and 3 of fulminating infection within 12 to 24 hours there were 5 cases and all recovered but 1 was traced for only 7 days and 1 other died from infection 7 weeks later within 29 hours there was 1 case and he recovered Two of the 5 cases in which operation was done within 12 hours had severe injuries and were not expected to recover The number of cases (including the undiagnosed) that recovered in spite of a long time lag is surprising Even though these injuries may kill quickly from fulminating infection a number of patients recovered even without early colostomy

Of these 1 cases with wounds of the rectum 14 were associated with fractures (two third) as follows fracture of the sacrum 6 fracture of the ischium 4 fracture of the pubis 2 fracture of the coccyx 1 fracture of the ilium 1 In 2 of these cases the femur was fractured in addition and in 1 the fracture extended into the hip joint

Other organs were affected as follows bladder 2 of which 1 died urethra 1 who died cauda equina 1 who recovered

In the cases which were diagnosed treatment consisted of colostomy with or without abdominal exploration the wounds were trimmed and enlarged for drainage Though in these cases there is no definite information available of the use of local or general chemotherapy its use was routine Anticancer serum was also used in a few cases

Intraperitoneal and Combined Wounds

There were 6 cases in this group The site of entry wound was as follows buttock 3 sacrum 2 perineum As to diagnosis all had signs of intra abdominal injury but in 2 cases only was there any indication of a

rectal lesion before laparotomy—1 with blood on the examining finger and the other had a large sacral wound

The time lag was 8 to 16 hours except in 1 case in which the lag was 24 hours and in another 36 hours One patient with a time lag of 8 hours and another of 36 hours died of acute infection The 16 hour case in which patient recovered passed a large *Ascaris lumbricoides* on the 16th day In the 24 hour case patient had an extraperitoneal lesion of the rectum and though the rectovesical pouch was full of blood no intraperitoneal lesion was found This patient had several secondary hemorrhages from the wound rectum and colostomy requiring ligation of the superior gluteal and finally the internal iliac artery

Other injuries found in this group were fracture of the sacrum in 2 cases and injury of the small gut in 4 cases

All patients in this group were treated by exploratory laparotomy colostomy and drainage In 3 cases the intraperitoneal rectal tear was sutured and all recovered in 2 cases suture of the intraperitoneal tear was impossible and both died in 1 case the rectal lesion was extraperitoneal and patient recovered Local sulfadiazine were used except in the 36 hour case with general peritonitis and for the extraperitoneal injury of the rectum

Nonpenetrating Wounds of the Rectum

There were 6 cases in this group In 3 cases abdominal tenderness and rigidity suggested intraperitoneal damage and exploratory laparotomy was performed In all the 6 cases there was extensive retroperitoneal hemorrhage in the pelvis with peritonitis though in 2 there was no evidence of penetration of the peritoneal cavity the small gut was injured in the third case The time lag in the case exhibited no abdominal signs without penetration of the pelvic cavity after 1 and 6 days Colostomy was established in all cases In the fourth case exploratory laparotomy was performed because an extensive sacral fracture indicated an injury to the rectum a colostomy was made as there was present a large retroperitoneal hematoma In the remaining 2 cases colostomy was not performed The

foreign body was removed from the pararectal tissues in 1 in the other a small foreign body could be felt through the rectal wall. This patient complained of pain in the perineum especially on defecation pressure on the foreign body produced pain in the distribution of the 3d 4th and 5th left sacral nerves. A small granulomatous nodule in the region of the foreign body was visible on sigmoido copy.

Complications

During convalescence it is important to maintain adequate drainage constantly. Osteomyelitis not infrequently follows injury to the bony pelvis and pocketing and tracking of pus occur. Large wounds of the sacrum are difficult to nurse and are subject to prolonged infection with its concomitant risks. Meningitis following lodgment of foreign bodies in sacral canal has already been mentioned after considerable time preliminary sulfonamide therapy and gentleness in removing such foreign bodies are essential. Only when a foreign body here requires removal should it be operated upon. Diphtheritic infection of the sacral wound was seen in 1 case. Secondary hemorrhage complicated 3 cases—rather a higher incidence than with wounds of the extremities.

Deaths

In the extraperitoneal rectal wounds there were 8 deaths. Two occurred within 4 hours, 1 from a fulminating infection and 1 from hemorrhage and shock. The death from fulminating infection (colon septicemia) occurred in a soldier who was operated upon 12 hours after wounding. His wounds were severe including a fractured femur and a torn urethra and injury to the small gut in the rectovesical pouch. He died of profound toxemia with a terminal temperature of 108 degrees. One died within 48 hours from a fulminating infection (colon septicemia). He was operated upon 1 hour after wounding. The abdomen was distended but there was no peritonitis. One died within 5 days. Operation was performed 8 hours after wounding. There was extensive retroperitoneal bruising. He became jaundiced after blood transfusion but death was most likely due to severe infection. Two died within 14 to 21 days, 1 on the 16th day

from gas infection of the abdominal wall and thighs and secondary hemorrhage, one on the 18th day from meningitis following the removal of a foreign body (time lag 8 days). Two died after 1 month, 1 death occurred in 48 days from infection following injury to both bladder and rectum with a rectovesical fistula. The rectal injury was not diagnosed and colostomy was performed late. In the other case death occurred in 49 days from an anaerobic streptococcal infection associated with fracture of the sacrum and neck of the femur. Chemotherapy and repeated blood transfusion were of no avail.

There was 1 death in the anorectal wound group. Death occurred in 10 days from extensive infection of the perineum and buttocks together with bronchopneumonia. Colostomy had not been performed until the 3d day.

There were 2 deaths among the intraperitoneal wounds. Both occurred within 6 days. In 1 from an unsutured tear of the rectum treated after a 36 hour time lag by drainage and colostomy. Patient was jaundiced before death and had peritonitis and toxemia. In the other from an unsutured tear of the rectum treated after an 8 hour time lag by drainage and colostomy. Patient had acute toxemia but no evidence of peritonitis.

In the nonpenetrating wounds 1 patient died from a wound which involved the thigh and the pelvis was fractured, anaerobic streptococcal infection and osteomyelitis developed and death followed in 1/2 months.

In the last world war a small series of wounds of the rectum complicated by wounds of the small intestine showed a mortality rate of 100 per cent while in the Middle East in this war a small series of similar wounds showed a mortality of 71.4 per cent (Ogilvie). In this paper since there is no information available of all the deaths from wounds of the rectum in the Forward Units a mortality figure cannot be given. However compared with the last war the number of survivors suggests an improvement in results.

SUMMARY

1. The classification and diagnosis of wounds of the rectum are discussed.
2. Operative treatment of extraperitoneal, intraperitoneal and combined wound is de-

scribed The indications for drainage of the pelvic cellular tissues are given

3 The risk of spread of infection within the pelvis with nonpenetrating wounds is mentioned

4 Thirty two penetrating and 6 nonpenetrating wounds of the rectum are analyzed

a Among the penetrating injuries there were 26 extraperitoneal and 6 intraperitoneal or combined wounds

b Early diagnosis was made in only two thirds of the extraperitoneal wounds the methods of diagnosis are shown Signs of

intra abdominal injury were present in all cases of intraperitoneal or combined wound

c The incidence of various sites of entry wounds of fractures of the pelvis and of other injuries is given

d The time lag complications and deaths are considered

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CONCUSSION OF THE SPINAL CORD

An Experimental Study and a Critique of the Use of the Term

R A GROAT Ph D W A RAMBACH J B S and W F WINDLE Ph D

Ch cag Illn s

THE meaning of the term concussion of the spinal cord is sufficiently vague to be a source of irritation to those who wish to use it. The present investigation was undertaken because it was felt that experimental clarification of functional and morphological aspects of an uncomplicated injury to the spinal cord of the type which rightly deserves to be called concussion was needed to aid in restricting in the sphere of application of the term. Studies in brain concussion (13, 14, 4) provide a lack of ground for the present experiments.

As will be described in the present report, uncomplicated concussion of the spinal cord in the cat is a complete functional block of the spinal cord at the level of application of an adequate force to the nervous plexus. Nervous cells especially of interneurons and long ascending and descending fiber tracts are involved. The period of concussion is brief, passing into the period of postconcussion when the paralysis ceases. Subtle but histologically demonstrable cell alterations occur in concussion and frank chromatolysis is evident in postconcussion as a direct result of the injury sustained. In any species if some other morphological change is present, e.g., compression fracture, self-reducing fracture, dislocation, severe epidural or subdural bleeding, contusion, or laceration of the spinal cord or spinal nerve roots or intramedullary hemorrhage, which superimposes functional alterations upon those of concussion, the injury is not concussion but concussion plus the complicating injury.

MATERIAL AND METHODS

Concussion was produced in cats by striking a single blow against the back of a freely suspended animal with a blunt wood instrument, using in a horizontal plane. Chalk applied to the instrument enabled accurate determination of the site of the blow. Most of the animals were lightly anesthetized

with chloralose. Others were struck after the spinal cord had been transected at the mid-thoracic level under ether and the region of the operation anesthetized with procaine. The blow was strong enough to produce a brief paraplegia when applied over the lumbar enlargement in intact unanesthetized cats.

In all animals the saphenous branch of the femoral nerve was exposed on the thigh and a unipolar or a bipolar stimulating electrode was attached to it. In 3 cats a fine bipolar stimulating electrode was placed in one pyramidal tract in the pons with the Horsley-Clarke instrument. The stimulator employed was one which gave a reversible sawtooth wave and the voltage frequency and the falling phase of the stimulus were controllable. Output dial were calibrated to show peak voltage.

The threshold voltages for elicitation of the appropriate responses were recorded over a 10 minute period immediately preceding a blow. Uncomplicated concussion was deemed to have occurred when the threshold rose instantaneously following a blow and then returned uneventfully to the control level. Blows were applied over various regions of the spinal cord. In two of the cats receiving mid-thoracic blows the vagus nerves were cut at the start of the experiment. Observations of functional alterations were made in 27 cats. Seven were allowed to live for 6 days, 3 for 14 days and 1 indefinitely after the concussion; the rest were killed at the end of the threshold testing period. All except the 14 day animals, which were used for Marchi degeneration studies, were perfused with 10 per cent formalin² (following initial washing out of blood with 0.9 per cent NaCl) while under nembutal anesthesia and were then autopsied.

Ten of the formalin perfused animals furished histological material. For additional histological material 3 cats were arranged for perfusion before being struck. The start of flow of formalin as timed so that fixing fluid entered the animal's body approximately 5 seconds after the blow was

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Designed by Dr. Craig Goodwin and Dr. M. L. Cullough (9) that described by Dr. S. D. B. R. C. L. and M. Cullough (9).
Some were perfused with formalin by Dr. C. L. Cullough (4).
Solved according to the method of (4).

struck. Three cats anesthetized surgically prepared and electrically stimulated but not struck served to control the histological phase of the work. Preparation of the spinal cord material and staining of the Nissl bodies myelin sheaths and axons cylinders were carried out as described in a previous paper on brain concussion (42). Some cords were sectioned transversely others longitudinally in the coronal plane. Serial sections were obtained from spaced regions of the entire cord.

The method for staining the Nissl material of the nerve cell cytoplasm was designed to give great uniformity of results. It employs dilute solutions of thionin made up in buffers of pH 4 to pH 4.5. Staining is carried progressively to completion and decolorizing is unnecessary. Control and experimental material of the present study was stained together simultaneously.

In order to facilitate the interpretation of cell changes which occurred in the spinal cords of the experimental animals ventral roots were sectioned intradurally in 5 other cats and the animals were sacrificed 6, 12 and 8 days after operation. Two or three roots were cut in each animal and the series embraced the third lumbar to the first sacral inclusive on one side only. Control material was afforded by the intact side of the cord and by portions of the adjacent segments cranial and caudal to those corresponding to the sectioned roots. The animals were fixed by perfusion with formalin-acetic acid sodium chloride solution (4). The appropriate portions of the spinal cords were serially sectioned longitudinally in the coronal plane and the sections were stained by the method for Nissl bodies (42).

PHYSIOLOGICAL RESULTS

Stimulation of the saphenous branch of the femoral nerve elicited reflex contraction of muscles supplied by the sciatic nerve. A distinct foot movement was chosen as the response for observation. A blow applied ventroproximo to the fifth lumbar spinal cord segment produced concussion the severity of which was estimated by the magnitude of the reaction and the duration of the erythema of the threshold threshold threshold reflex. The severity of the concussion measured with the strength of the blow. The intensity of the spinal cord injury led to concussion upon gentle blow followed by the strength of that blow. A blow produced concussion at the seventh and eighth thoracic segments did not produce sufficient production of concussion at the first five lumbar to second sacral. It re-

sulted in hyperirritability of the hind quarters to saphenous nerve stimulation. Blows spaced from the eleventh thoracic down to the third lumbar segments caused progressively greater increase in threshold for the femoral sciatic reflex. Effectiveness of blow over the first and second cervical vertebrae in producing concussion of the region of the lumbar enlargement was much reduced.

In the few times observed a femoral-obturator reflex behaved just as the femoral sciatic reflex.

Contraction of the pterygus muscle below the mandible also resulted from stimulation of the saphenous nerve. A blow produced concussion at the lumbar enlargement caused a rise in threshold of this femoral sciatic reflex. A blow produced concussion at the seventh and eighth thoracic segments did the same.

Stimulation was applied in the pyramid to the hind limb movement and slight forelimb movement. A blow at the lumbar enlargement caused a rise of threshold of hind limb movement. A blow at the eighth thoracic segment likewise readily caused an increase although forelimb movement in to nerves for which originate from cord segments close to the site of the blow was little affected.

Occasionally an animal exhibited considerable general muscular activity on saphenous stimulation. A blow to the lumbar enlargement completely abolished this response while the level of the eighth thoracic segment extended it only rostral to the level of the blow.

In one fourth of the instances in which concussion was produced at the level of the lumbar enlargement the hind limbs immediately extended in tonic spasm lasting 5 to 5 seconds. The occurrence of spasm seemed to be unrelated to the severity of concussion.

Results from an animal with various nerves of peripheral order did not differ from those described above.

In stimulating the saphenous nerve a wide frequency of response and early always a falling phase of response were secured. Critical threshold values (all series combined) for the femoral sciatic and for the facial reflexes ranged from 0.4 to 0.8 C. Units. Thresholds tended to greater than normal. Stronger stimuli were not used. In two-thirds of the instances threshold returned to the control values. In the rest thresholds returned early to control level. Recovery was generally accomplished in 1 to 5 minutes although the time ranged from less than 1 to 5 minutes. In general threshold fell gradually though the recovery period usually faster during the early period.

For stimulation in the pyramid a frequency of 100 per second was employed. Control threshold ranged from 0 to 50 volts. Other details were the same as those described in connection with saphenous stimulation.

No gross functional aberrations referable to spinal cord damage were seen in the injured cats in a period of 14 days after the concussion. There is the possibility, however, that the proper type of test would reveal some abnormalities.

MORPHOLOGICAL RESULTS

Most of the animals which were struck one blow suffered no hemorrhage inside the vertebral canal although many had traces of blood in the musculature at the site of the blow. Some had light extradural or subdural hemorrhage but no intramedullary bleeding. In these and in two cats which suffered complete transverse fractures of intervertebral discs without any alteration inside the vertebral canal there were no functional indications of the complicating condition. A second or third hard blow at the same level often produced intramedullary hemorrhages or extensive subdural bleeding leading to compression of the cord. Delayed effects of the complicating injuries upon thresholds could usually be observed in such cases. In 21 instances very strong blows produced fractures which lacerated the cord and produced functional results readily distinguishable from those of concussion.

Histological examination of the affected region of the spinal cord of the animals perfused immediately after the blow revealed subtle changes among all nerve cells except the motoneurons. The Nissl bodies of most neurons seemed to be agglutinated and the nucleolus was more often irregular as compared to control material and as compared to more remote segments in the same animal. These changes were essentially the same as reported in the brains of guinea pigs upon concussion (42).

The chief histological alteration found in the spinal cord 6 days after concussion was chromatolysis of nerve cells at a level underlying the external site of the blow. The principal participants in this reaction were interneurons of large and intermediate size of both dorsal and ventral grey columns. Many were reduced to mere shadows which could not be photographed although all stages of degeneration were found. Some may be seen in Figures 4 to 8. The smallest interneurons were probably also affected perhaps even diminished in number but it is difficult properly to assess changes in these small cells.

The longitudinal spread of this process of chromatolysis in the number of cells affected by it

were directly proportional to the severity of the concussion. Following a moderate concussion many chromatolyzed cells were found within about a 3 centimeter length of cord. For a distance of about 1 centimeter beyond either end of this region were found a relatively few scattered cells undergoing chromatolysis.

A comparison of the concussion material with spinal cords from animals in which ventral roots had been sectioned intradurally revealed two pertinent points. First relatively few motoneurons (cells which under ent chromatolysis following severance of ventral roots) underwent chromatolysis after concussion and these were located within a few millimeters of the center of the affected length of spinal cord. Second most of those chromatolyzed motoneurons found 6 days after concussion were in a stage of degeneration far beyond that of motoneurons 6 days (or even 12 or 18 days) after ventral root section. Compare Figure 2 with 3.

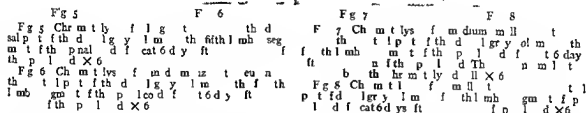
The only axon cylinder abnormalities seen in the spinal cord 6 days after concussion were some terminal bulbous enlargements. These occurred only in the more severe concussions and then to what would seem to be an insignificant extent. They were nearly entirely limited to the lateral funiculus in a segment of cord 3 or 4 millimeters long at the middle of the injured region. The absolute extent of this pathology was 0 millimeters to 15 millimeters.

Myelin sheaths as studied with the Weil stain were normal. So were blood vessels. There was no proliferation of glia or transformation into pathologic glia in the injured regions. Dorsal root ganglia, dorsal roots and ventral roots showed no abnormalities 6 days after concussion even at the level of most intense chromatolysis within the spinal cord.

One cat was allowed to live indefinitely after sustaining three spinal cord concussions, one of which was severe. The animal remained healthy, continued to grow and showed no abnormalities. At last observation 7 months after the injuries were inflicted the cat weighed 4.12 kilograms as against the original weight of 2.95 kilograms. Thus spinal cord concussion was not followed by slowly progressive degeneration in the spinal cord due to primary nervous tissue damage or to vascular involvement.

DISCUSSION

It would seem that one important effect of spinal cord concussion is interruption of function of the cell bodies of the interneurons and to a much lesser extent of the lower motoneurons. Certainly



in any concussions of the midthoracic region. If the conduction block in nerve fibers which we demonstrated was analogous to that which K. Ems Schoepfle and Erlanger observed in the dissected sciatic nerve of the green frog compressed by a blast from an air pistol, we should have expected to have obtained better evidence of the immediate discharge which preceded partial or complete block in the preparation, and of the repetitive spikes initiated in the blocked fibers. If the sequence of concussion is a depolarization of nerve cell membranes with resulting massive discharge as W. L. Kollros and Case have stated, we should have expected tetanus of hind limbs to have been a constant concomitant of concussion of the spinal cord in the region of the lumbar enlargement. Since tonic spasm when it did occur was not clearly associated with any magnitude of blow or severity of block, it cannot reasonably be said to have indicated concussion.

All evidence indicates that the lysis of Nissl bodies in postconcussion is directly attributable to physical injury of the cells sustained at the time of concussion. In both brain concussion and spinal cord concussion morphological evidence of this immediate physical injury may be seen as a subtle intraneuronal disorganization. The postconcussional chromatolysis is clearly different from that following axon section as previously. Finally, the evidence is usually no evidence of inflammation following concussion.

Spinal cord concussion at the level of the phrenic nucleus or higher would perhaps lead to fatal arrest of respiration. We have made no study of the effect of high blows because the topography of the cervical region practically precludes the possibility of uncomplicated spinal cord concussion.

There is reason to believe that spinal cord concussion as suffered by man is more severe in its physiological aspects than in the cat. In the cat a midthoracic blow does not alter the threshold for the femoral sciatic reflex but in man it probably could due to the much greater depth of spinal shock to which man is subject. Perhaps intervention of spinal shock can in some way lengthen considerably the period of functional recovery following a reversible spinal cord injury. In addition there is the possibility that spinal cord concussion can be more severe in man than in laboratory animals because of the greater strength of the vertebral column and consequently the greater force that can be applied to the nervous tissue without producing complication.

A major aim of the present study is clarification of the term concussion. Persistent use of it to cover traumatic injuries of the brain and spinal cord displacing the most diverse clinical and pathological findings has greatly muddled thinking and writing on this important subject. This state of affairs is mildly indicated in so recent and excellent a book as *Principles of the Skill Examination of the Spinal Cord* edited by Brock, where different



Fig 9 A. (d) Ig y l m l d Cl k l m f il Th h m t o l y e d t
t t h t l f t t Cl k l A d t h m t b y d l X 4

rte used cuss on nd fierent senses and the ed to found it cessary to add e planatory r ma ks and g d g notes at se e al pl c Th sh uld b corrected t arb tra lv but p c ti al and sound bas

If the te m concussion is to be applied to b th b a n and spin l cord injur es let the fu ct o l nd p th lo cal b fo appl cat o n the two instances be as smil p sibl C c ssion of th b a n has b sho n to be a state mm d ately f ll w gappl t n f ad qu tef eto the bra n a st te n h ch chiefly the interneuron e n p c tated es lt g n a t a s e n t p a l y s e e n th o h n l motor nuclei e u s lly not

fic tly affected Stru tu al alteration n n terneurons ha b n demonst ted r c sso and ch omatol ysis has been hown to o u the e lv post ncuss np od E ept for fib rd m age so met mes perceptible m lyp t cuss on th s t b e tent f th pathology m nd fter s mple concuss on of the br m (4 14)

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Ma y p e s t at h a e r p t e d e p e r m e n t a d p t i e n t n w h h p i a l c o d o n c u s s o n w s d s t i n g u i s h d o t a t l l r o l v f i g r a t e l f m t m t i c h m o r h a g o n t s l e r a t i o s d s e r d e g t e p e s s e s B t t h e l i t t l e m t h i t e t r e t i n d c a t t h a t v o e e r t h h t d f i n t l y o f p a l c d c o c u s o n a a r e r b l i n j r y w t h o a t m u c a l b a s s Th i o e a o n t f a u l t g e w t h e t r u e a t r o f p u n l c d e c u o a s a b r i f s p i n a l c o d b l k w t h t b a d t e r n e u m o l e m e n t K n h t p p o a h e d t h i s u d e r s t a d g w h b e w o t t h t u c o m p l e t e l c u s o f t h e p m a l o d w l e o l e c o m p l e t e l y w t h t m e b t f t h c c u s o m k s n d l g

contusion the signs of the latter injury will become manifest as concussion passes off. Recovery from the symptom of spinal cord concussion in humans according to Knight may occur within 24 hours or be delayed for a week or more.

The indiscriminate use of the terms spinal cord concussion or spinal concussion arose in and has been perpetuated by uncritical clinical pathological and experimental observations. Pathological studies in man were all on severely injured patients or else were not judiciously appraised from the etiologic standpoint. All or part of the lesions found were assigned to concussion. In the laboratory very severe injuries were inflicted on animals and were called concussion. No adequately correlated functional and histologic experimental studies were produced. Consequently no one knew what sort of pathological picture a recovered case might have displayed. In addition the attempt was never made to dissociate early functional disturbances from excessive pathological changes in order to cover the maximum functional aberrations which could occur with the minimum anatomical alterations. Hence in the clinic and in the laboratory trauma which affected the spinal cord without grossly contusing or lacerating it was said to result in concussion regardless of the real nature of the lesions. If the spinal cord was directly contused or lacerated by a missile or bone fragment it was still said to have suffered concussion adjacent to or even remote from the directly contused or lacerated area if the other parts showed any pathological changes. In this way concussion came to be used as a very nonspecific term and what was most unfortunate the use of other more specific terms was passively discouraged.

Erichsen wrote in 1886 (1st ed 1885) that there are four forms of lesions leading to fatal results: cases of spinal concussion (1) hemorrhage within the spinal canal (2) laceration of the membranes of the spinal cord and extrusion of the medullary substance into the spinal canal (3) extravasation into the substance of the spinal cord and (4) disintegration and perhaps inflammatory softening of the spinal cord. Erichsen also mentioned molecular disturbance and anemia as causes of concussion. Further he included as spinal cord concussion case in which injury was remote perhaps not even affecting the vertebral region followed by general nervous disease and injuries in which symptoms were delayed and transient arose.

Obersteiner described as concussion a case of gunshot injury of the spinal cord. The survival time was 5 weeks. There was an extensive area of softening and widespread degeneration of the spinal cord.

Page in 1885 (1st ed 1888) severely criticized the writings of Erichsen and others. He was of the opinion that their reports were based upon faulty interpretations and that there was no evidence for their conclusions. However he contributed nothing constructive to the knowledge of spinal cord injuries.

Spiller reported fatal injuries in a kitten (30) and in a human being (40) which he called concussion of the spinal cord. Pathological alterations were minute hemorrhages and Marchi degeneration. In the kitten there were alterations of the anterior horn cells.

In 1900 Hartmann published a paper on uncomplicated traumatic spinal cord diseases. The title is somewhat misleading because by uncomplicated the author meant all the cases in which there was no persistent injury to the vertebral column such as fracture or unreduced dislocation. Symptoms set in at once or were delayed. The pathology included primary and secondary fiber degeneration, hemorrhages, foci of necrosis, degeneration of anterior horn cells, root degeneration, glioproliferation, blood vessel changes and meningeal involvement. The blood vessel changes were considered to be very significant and to lie at the root of much of the other damage.

Holmes, Claude and Lhermitte (5, 6) Lhermitte (26) and Ferraro (11) reported on spinal cord pathology in soldiers in whom the vertebral column was injured by a projectile without the spinal cord receiving a direct wound. The cases were spoken of as concussion. Clinical symptoms were those of total or subtotal transverse cord lesions. All found foci of necrosis, cavitation, acute primary degeneration of nerve fibers and glioproliferation within several segments of the level of injury. Besides Claude and Lhermitte (5) and Lhermitte (26) found spinal nerve root degeneration and alterations of the central canal. They declared that the bodies of nerve cells of the gray substance were remarkable in their resistance to concussion. In addition Ferraro (11) found focal hemorrhages and changes in the wall of blood vessels. Holmes also found hemorrhages.

Marburg (30) and Marburg and Ranzi (31) described the pathology of the same type of injury cases but refrained from applying the name concussion to any of them. The most important change Marburg believed was an alteration in the walls of blood vessels leading sometimes to occlusion. He felt that most of the other pathology was the result of vascular alterations.

Mott referred to a case as spinal concussion in which there was a paralysis of arms, legs and intercostal muscles together with an esthesia below

the second cervical level and followed in 2 days. Extensive meningeal and intramedullary hemorrhages were found. The cells in the phrenic nucleus at the fourth and fifth cervical segments were entirely destroyed. There was vacuolation of myelin and swelling of axon cylinders at the seat of the injury.

Hassin (16) reported as concussion of the spinal cord a case in which the patient tripped over a wire and fell striking his right shoulder. He arose and resumed work. Weakness of the right hand was present 4 weeks later and by 11 months both arms and legs were weak and showed wasting. The patient died of pneumonia 18 months after the fall and shortly after a laminectomy which had revealed no evidence of fracture or dislocation or bony lesion. There were widespread degenerative changes of the anterior horn cells associated with proliferative neuroglial alterations. There were microcopic foci of degeneration or softening in the anterior horns in the lower cervical region. The posterior horns and Clarke's columns showed practically no cell fiber degeneration. No spongiotic changes were found in the lateral columns involving the lateral corticospinal tracts, the lateral limiting zones and Goll's tracts. The fiber losses were said to be secondary to the cell lesions, the delicate cell suffering most from the jar. Hassin attributed the late onset and progressive course of the clinical symptoms to the time necessary for nerve fiber degeneration to become manifest. In this (16) and a later paper (17) Hassin tied the evidence of concussion on of the spinal cord even far away from the region directly affected.

Davison and Keschner attributed to concus on the foci of necrosis which they found at varying distances below the primary lesions in cases of compression fractures.

Topical treatment of the patient dying 15 days in 8 days in the other forearm 14 days formed the basis for the statement of Bald in that primary and secondary degeneration of nerve fibers consists of frequent and destruction of ventral horn cells resulting in festations of coagulation of the spinal cord.

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cord. Many of the vessels throughout the spinal cord were congested. Diapedesis of red blood corpuscles was found associated with vessels showing degenerative change in the endothelium.

Clinton Clark MacDougal Hartman and Samuel Ilford reported as concussion cases in which back trauma was followed by paraplegia as a result of impact of ensation and retention of urine. The symptoms began to regress in a few days and recovery was nearly complete in approximately 2 to 6 weeks. The delayed recovery times probably indicate that the injuries were contusion plus compression.

As has been implied previously to experimental trauma has not been found to have any direct effect on the spinal cord. The work of Schmaus in 1890 reported that the spinal cord concussion could be influenced by thought in the field. He cited fatal cases of the human being and a cat to show that the fiber damage was which is found in the spinal cord at death some time after injury is primarily and is not due to some gross lesion which interrupts the fibers. Besides this is the decrease in the power of the sensitive functions in the spinal cord including hemodynamic softening and cavitation. He reported spinal cord injuries by a blow to the back repeated blows on a board laid on the back. It should be mentioned that this method of producing injury by any repeated blows first used by Kolb and Filhne in 1874 in his injury studies and subsequently employed by others in spinal cord investigations has no practical basis. In Schmaus' case the cavitation was set in motion on the blow which he delivered on a part of a few or many days. He made no further studies in any other animal. He seemed completely recovered from the traumatization as it topped. In most cases the paraparesis of the hindlimbs is limited and atrophied after the second week. There is an animal sacrificed or died to 44 days after the termination of the experiment. The trauma on the cord was studied briefly. In some the nerve was histologically found in the nerve fiber and cell in general of the animal which gave the entire result were those which had only a short time. In the tall ante or hind cell of the spinal cord was the whole of the author's test to interpret. He thought the animal had a normal function in the cell. The great change was a primary disturbance in the nerve fiber. The spinal cord was subdural hemorrhage and the medullary horn was soft. The spinal cord was not caustic for many of the animals.

Kirchgaesser (20 21) laid a rubber mat on the back of rabbits and struck repeated blows with a hammer on one or several days. Five animals were killed and one died after 8 to 13 days. These were studied by the Marchi and the Weigert method. Five had suffered complete paralysis with partial or complete recovery. These showed extensive primary degeneration of nerve fibers at the level of the blow and ascending and descending degeneration elsewhere. In a sixth animal which had exhibited brief tetanic spasms only, the changes were not as great. Two animals with different degrees of trauma and paralysis were killed 15 to 14 days after the start of the experiments and the material was used for Nissl and for Marchi preparations. Fiber degeneration was severe but cell changes were considered by Kirchgaesser to be practically negative and capable of playing only an incidental secondary role to the striking fiber changes. These injuries were all called concussion.

Jakob produced spinal cord trauma and although he did not specifically designate it concussion others have done so. The injuries were produced in rabbits by striking hammer blows against a board laid on the back. Two to two blows were delivered on 1 or 2 days. In 3 animals which died within half an hour there were no changes in the central nervous system except hemorrhages but the liver was ruptured in 2 of them. In 3 animals killed 21 to 32 days after the first injury there were extensive primary and secondary fiber degeneration on variable degrees of softening and hemorrhages, a few scattered degenerating cells and heavy ganglion cell degeneration at the edges of the softenings and around the widened central canal. In an animal killed at 45 days there was secondary degeneration of fibers and in one killed at 4 months there were degenerating fibers and fresh hemorrhages. The last 5 rabbits were paralyzed in the hind quarters for periods ranging from more than 1 day to 10 days. Two animals were each dealt two light blows which produced short tetanus of the hind limbs without indications of paralysis; they were killed 7 days later. There was widespread diffuse fiber degeneration but no cell changes. In one of these animals the cerebra was a few small hemorrhages in the spinal cord.

Marinesco reported on experimental concussion lesions produced by exposing dogs to gun cotton explosions. Lesions were most acute in those animals which lived 8 hours after the injury. In the spinal cord punctate hemorrhages were especially numerous in the anterior and middle gray substance of the thoracic region. Nerve cells enclosed in these hemorrhagic foci were undergoing chromatolysis. The small peripheral

mal vessels were congested and the central canal was irregular in contour. The cells of the spinal ganglia were normal despite hemorrhages about the ganglia and in the neighboring portion of the dorsal roots.

Maret and Durante produced so called concussion lesions in rabbits by exposing them to the detonation of explosives. Early lesions in the spinal cord consisted of slight pial bleeding perivascular ecchymoses more abundant in the white than in the gray matter and hemorrhages in the roots. Fiber changes were described but whether they were artifacts or true concussion alterations was left open. There were no changes in nerve cells of the spinal cord or dorsal root ganglia. Some animals were allowed to live for 5 to 9 months. They showed no abnormal behavior. No macroscopic lesions were found. In the spinal cord there appeared to be a size inequality of the anterior horns and a diminution in number of motor cells many of which were small and without processes. In some cases fiber changes were seen near the periphery. There was no secondary degeneration in the white matter.

The work of Roussy, Lhermitte and Cornil is one of the most misleading publications on concussion of the spinal cord. These authors first reported on the results of direct trauma against the vertebral column in 6 guinea pigs and 1 rabbit. The animals were struck two to four times in the thoracic region. The injuries were severe not only involving the vertebral column and spinal cord but also the vertebrae and ribs. The authors had trouble obtaining material for histological sectioning because of the mortality of their animals. The animals used were saved as long as possible but their poor general condition always necessitated their sacrifice. The thoracic region of the spinal cord was studied microscopically. In 2 guinea pigs killed 15 to 20 minutes after the blows there was said to be acute primary degeneration of nerve fibers in the peripheral region—axis cylinders were hypertrophied, varicosities irregular and very fragmented and myelin sheaths were distended—and the neuroglial meshes were dilated. Two animals which had brief paraplegia and abnormal reflexes and were killed 17 and 8 days after the first blow showed acute primary degeneration of nerve fibers in the marginal zone dilated neuroglial meshes but no changes in the gray matter. In 1 guinea pig and 1 rabbit killed 13 and 3 days after trauma there were macroscopic regions of softening which microscopically proved to be areas of cerebral edema and necrotic foci affecting practically the whole cross section. Finding was negative in a guinea pig killed 5 months after injury. The

authors stated that findings in human pathology are the same—foci of focal necrosis and acute primary degeneration of myelinated fibers the latter mainly in the peripheral region. These lesions they stated affect one or several segments of the cord at the level of the blow. This quite obviously seems to be a guess. The authors also reported a dog which, as subjected to indirect trauma of the vertebral column. It was fixed with its back tightly against a board anesthetized and the violent hammer blows were struck against the board. The animal showed no abnormal signs when it awakened in the following days seemed completely well. Two months later it became generally emaciated despite normal food intake. The wasting was progressive and 6 months after the trauma the dog was described as thin and bones. Still there were no neurological signs. The animal succumbed to this cachexia. The spinal cord was absolutely normal upon gross inspection. It was stained by a method for Nissl bodies. The anterior horn cells were frankly atrophied. The author stated that these findings supported the thesis of Kirchgesse () that the intensity of the cellular alterations was inversely proportional to the violence of the trauma. Kirchgesse propounded a such theory. The cord tended to have shown that at trauma directly on the vertebral column attacks chiefly the myelinated fibers of the white substance and indirect trauma of the vertebral column injures the cord less intensely. Looking cellular lesions more readily.

Fe () conducted histological studies what he called spinal cord concussion in 9 rabbits killed 1 hour to 6 days after being struck on the back with a mallet. Sections were stained with toluidine blue and a few Golgi. In his one hour animal he reported loose appearance of tissue in places slight enlargement of some neuronal cells sharply demarcated areas in the white matter of deeply stained enlarged and foamed vacuolated swollen myelin sheaths occurred in 15 minute foci of necrosis in the gray matter. The saturation of nerve cell bodies stained chromatin bodies of nerve cells indicated either along the upper part of the cell body or surrounding the nucleus located in the nucleus. The pharyngeal fibers but at day 4 and day 6 cell bodies were diminished. At 4 hours normal had in addition the bodies were merged together. The nerve fibers and the cytoplasmic elements of peripheral cells were found in the spots of the reduction in the human animal the nerve fibers and cell bodies were found in the nucleus of the nerve cells. The findings of the method were evaluated and the results were published.

walls were thickened due to relaxation and the were degenerative changes in spinal roots especially the posterior. There were no lesions in the spinal ganglia. In the reticular one of entrance some of the axons ended in the elements so called Schmaus bodies. In an 18 hour animal the lesions were more severe. There were empty holes left by degenerated axons. The nuclei of the cleaved axons occasionally displaced into the vacuolated nerve cells. In 30 days a dog showed animal degeneration in the white matter as progressively more advanced. At 90 hours degeneration was diffuse and intense. At 6 days there was a pronounced neuroglial reaction. Nerve fiber degeneration was more advanced many axons underwent complete disappearance without trace and some reduction was pronounced. Nerve cells especially the anterior horn cells sometime showed the reaction.

These have been the principal findings in experimental pathological studies. It is important to be of conclusion of the spinal cord. Little comment is necessary. One of the outstanding difficulties of previous work on the subject is lack of histological controls. The need for clarification of the term concussion is evident. As deformation that affects the incompressible conclusion that many of the recorded observations are of questionable value.

It is clear that the functional alteration in the attending histological changes have been described in the cited other paper (13, 14, 15). It is a specific demonstration from both clinical and a pathologic standpoint. This is true because the essential functional lesion has been shown in the central nervous system of peripheral changes. It is these changes in the brain and spinal cord that the term concussion should be applied to that the neural elements of clinical frequency. This procedure then purges the hole of the emergency field from the technical nomenclature. The most difficult fusion and no specific terminology and permit of the accurate conclusion of the differential clinical and pathologic conditions. It is to be understood that the results in a moment of injury have shown the same result. It is further noted that the term concussion is applied to the cell of an intradynamic process such as bilateral not to the process itself.

SUMMARY

Spinal cord concussion studied at 4 blw pple derpmately the thumbar spinle d gmetp d d oncus o th se ty of wh h a m s d by the mgnt de of ea e ad the d to f e r t me of

the threshold for a femoral sciatic reflex. The severity of the concussion and the longitudinal extent of spinal cord involved increased with the strength of the blow. A blow producing concussion at the seventh and eighth thoracic segments did not spread sufficiently to produce concussion of the region of the cord involved in the reflex. Blows spaced from the eleventh thoracic down to the third lumbar segments caused progressively greater increase in threshold for the femoral sciatic reflex.

A blow producing concussion at the lumbar enlargement caused a rise in threshold of a femoral facial reflex. A blow producing concussion at the seventh and eighth thoracic segments did the same.

Stimulation was applied in the pyramid to evoke hind limb movement and slight forelimb movement. A blow at the lumbar enlargement caused a rise of threshold for hind limb movement. A blow at the seventh thoracic segment likewise readily caused an increase although forelimb movement motor nerves for which originate from cord segments closer to the site of the blow was little affected.

Occasionally an animal exhibited considerable general muscular activity on saphenous stimulation. A blow at the lumbar enlargement completely abolished this response while one at the level of the seventh thoracic segment extinguished it only rostral to the level of the blow.

In one fourth of the instances in which concussion was produced at the level of the lumbar enlargement the hind limbs immediately extended in tonic spasm lasting 5 to 25 seconds. The occurrence of spasm was unrelated to severity of concussion.

Histological studies were rigorously controlled. Examination of the affected region of the spinal cord of animals perfused immediately after the blow revealed subtle changes among all nerve cells except the motoneurons. The chief histological alteration found in the spinal cord 6 days after concussion was chromatolysis of nerve cells at a level underlying the extensor site of the blow. The principal participants in this reaction were interneurons of both dorsal and ventral gray columns. A comparison of the concussion material with spinal cords from animals in which ventral roots had been sectioned intradurally revealed 2 pertinent points. First only relatively few motoneurons (cells which underwent chromatolysis following severance of ventral roots) underwent chromatolysis after concussion and those were located within a few millimeters of the center of the affected length of spinal cord. Second most of those

chromatolyzed motoneurons found 6 days after concussion were in a stage of degeneration far beyond that of motoneurons 6 days after ventral root section.

Uncomplicated concussion of the spinal cord in the cat then is a complete functional block of the spinal cord at the level of application of an adequate force to the nervous parenchyma. Nerve cells principally interneurons and long ascending and descending fiber tracts are involved. The period of concussion is brief, passing into the period of postconcussion when the paralysis ceases. The much greater depth of spinal shock to which man is subject perhaps adds to the profoundness of the functional alterations in man. Subtle but histologically demonstrable cell alterations occur in concussion and frank chromatolysis is evident in postconcussion as a direct result of the physical injury of the cells sustained at the time of concussion.

A review of the literature on spinal cord concussion supports the statements that the term concussion must be clarified and that many of the recorded observations on spinal cord concussion are of questionable value. The functional alterations with their attending histological changes which we have described in this and in other papers merit a specific designation. It is to these injuries of the brain and spinal cord that the term concussion should be applied and to these alone.

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IMMEDIATE SKIN GRAFTING FOLLOWING INJURIES

M. K. KING, M.D., F.A.C.S., Norfolk, Virginia

WOUNDS which can be surgically cleansed, debrided and closed within 6 hours after injury usually heal by primary union. This applies to compound fractures as well as injuries to soft tissues. The secret of such healing is surgical cleansing and is dependent on no anti-septic or bacteriostatic drugs. We have adequately demonstrated this principle in treating several thousand injuries over the past 10 years. Before the introduction of the sulfonamides we routinely closed compound fractures and other injuries when they were seen early.

In war wounds such treatment is not recommended. There is neither the time nor facilities available for the meticulous cleansing and debridement necessary in the first few golden hours. On the home front most patients with injuries come to the hospital early and the conditions are such as to make closed method of treatment safe and practical.

To be successful cleansing must be thorough. Every particle of foreign material and devitalized tissue must be removed from the wound. This treatment requires time, patience, adequate anesthesia and plenty of soap and water. A stiff brush may even be necessary to remove dirt ground into the end of a bone or the bone may have to be cut back for a short distance. Unless one is certain that all dirt has been removed it is safer not to do a primary closure.

We have some additional safeguards in the sulfonamides when they are used in addition to and not as a substitute for surgical cleansing. Sulfanilamide crystals is the usual drug of choice. It may be frosted into the wound just before closing. It undoubtedly has decreased the incidence of infections in wounds when properly used but it should be stated most emphatically that sulfanilamide will not prevent infection in a dirty wound.

Primary healing frequently means a saving in time of weeks or even months. It means decreased hospitalization and expense. It means minimum pain and deformity with maximum functional result.

Unfortunately many wounds cannot be closed primarily because of loss of soft parts or because of swelling. By means of skin grafting many such

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wounds can be closed and primary healing achieved. A few examples of such injuries will be discussed.

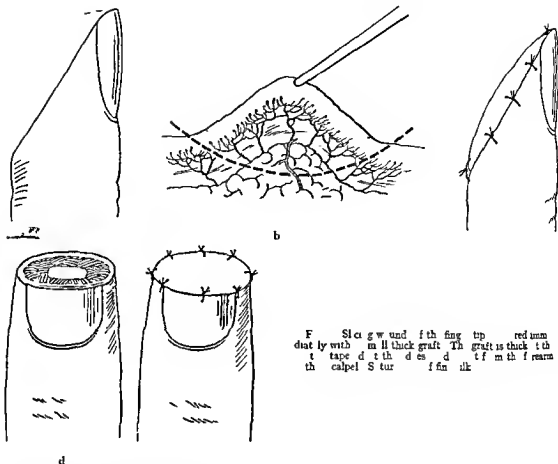
ABRASIVE WOUNDS

This type of injury is usually produced by contact with grinding tools, by being dragged over a roadway or by contact with a moving cable or rope. The wound is painful and dirty and the dirt is ground into the underlying tissues.

Treatment consists of thorough surgical cleansing under adequate anesthesia and covering the surface with a partial thickness graft (Fig. 1). Local anesthesia is inadequate. Pentothal is usually very satisfactory. The wound is covered with sterile gauze until the remainder of the limb is thoroughly scrubbed with soap and water and ether. The wound is then irrigated gently and particles of dirt and devitalized tissue are removed with forceps. Sharp dissection should be used when necessary. A small continuous stream of sterile water or saline facilitates the cleansing. Cleansing and debridement should be continued



Fig. 1. Abrasive wound of forearm. Wound closed by skin graft. The patient was treated with Pentothal and the wound was covered with sterile gauze until the remainder of the limb was thoroughly scrubbed with soap and water and ether. The wound was then irrigated gently and particles of dirt and devitalized tissue were removed with forceps. Sharp dissection was used when necessary. A small continuous stream of sterile water or saline facilitated the cleansing. Cleansing and debridement should be continued.



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untl one has a surg cally clean v o nd with only h althy viable t ssue rema n n

Finally the surrounding area s pai ted w th merthiolate and the v und is draped with sterile sheet A parti l thickness skin graft is taken f om convenient area suffici nt to c ver the wound The cutting may be d ne with a knife o ra or but the P d ett dermatome far super or f r co ering l rge a s Furthermore the grafts are mor unifo m n s i nd th ckness and there is less damage to the donor te Ag ft of 004 to 0018 nch i easy t handl g es a good cos metic esult and le es a donor st e v h ch he is ap dly w th o t scarr g

Be f re the graft s applied the wou d is fr ted lightly w th cryst lline sulf nylamide The gr ft s sutured in posit n und sh ht t ns on by means of fine silk on n at aumat c needle A quilting patt rn f sutures used to b m o th graft int firm app it n w th the unde lyn bed and these suture s dec ease the need fo ccu

r tely applied pre s e postoperati ely (Fig 1 b) They als allow serum to escape and by ate the necessity fo cutt holes in the graft It does not matt r if a few islands f the riginal skin are pre ent ben th the g ft When s tur n s om pleted the wh le rea is ain spr kled lightly with sulfanil mide crystals a gauze sponge satu r ted with sterile glycer e s pressed down firmly on the graft and b lky gau e dr ssings are ap plied Mode te p ure is ma ntained w th ad hes e str ppm or el st c ba d ge We ha e f und speci l dres ngs unnecessary Mech ncs w ste tool mpy d gives n une n p es ure Th outer f res in s a removed n 3 days and if the wound s clean a d dry it is adressed a d after n the 5 d ys the s t es ar remo ed

If the details o llined ar f llowed a 100 per cent tak of the graft should be bt med Heal ing time i greatly short ne l d c m f r t m mized nd the c smetic esult s cellent in this method of t eatm nt

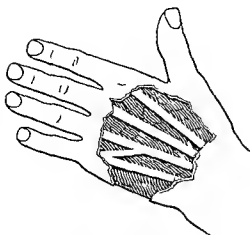
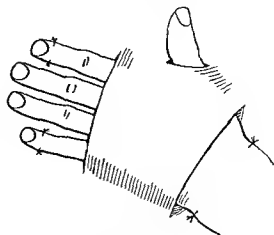


Fig 3 a l f t W o u n d f t h d u m f h d l v g
t s o t d p o d I f t h t d t f m t d
l g a m y b p e t d w t h p h a d d f m t y
A p t l t h l g f t w l t g g d f t u b
g h t A f t g l c l n g d d e b d m t t h b d



h a s b e p l d p o c k t f l a p t h b d m t h f p
t h u c k d m m f t N t t h b t t
p t m m t f t h b d O d f t h f l a p d
v i d d y t d y t h t h t 7 d y s T h b
d m l d f t d w t h a p t l t h k a s g r f t

SLICING WOUNDS OF THE FINGERTIPS

Slicing injury of the fingertips is common in those who work with knives sharp-edged tool or machinery. If the wound is allowed to heal spontaneously it means healing by granulation and almost always results in a tender or painful scar. Many patients will return later requesting amputation for relief of these symptoms. If primary closure is attempted it is necessary to shorten the bone in order to secure an adequate skin flap.

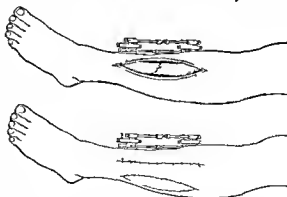
Immediate application of a thick skin graft to the wound will give rapid healing good function and will avoid further shortening of the finger (Fig 2). The operation is a minor one and can be performed in the office or dressing room under procaine block anesthesia. The whole hand is thoroughly scrubbed. Usually very little cleansing of the wound is necessary since it is a smooth cut with free bleeding. Bleeding can be adequately controlled by pressure. The graft is cut from the flexor surface of the upper forearm in the same manner as a large pinch graft. A pattern is unnecessary for such a small graft. In females it may be desirable to use some portion of the anatomy other than the forearm. The graft should be full thickness at the center with a little of the subcutaneous tissue and taped at the edges. It is sutured into position with fine interrupted silk. Sulfanilamide powder is sprinkled about the wound and a glycerine gauze dressing applied and the finger bandaged under slight pressure.

Rapid clean healing is all that follows the procedure and a successful take may be expected in over 80 per cent of wounds so treated. Pain per-

ceptibly disappears after the graft is applied and whether the graft survives or not pain is greatly minimized in contrast to that seen when the wound is left open. Indeed this is true of nearly all wounds treated by skin grafting. A very painful burn will become almost painless once it is covered with skin.

WOUNDS LEAVING EXPOSED TENDONS

Injuries in which the tendons are left exposed always lead to considerable disability unless



F 4 b o C o m p o d f t u f t h t b i a d b b
l T h w d m t c u l l y l n s d d t h f a c t
d e d d d i e c t h u t l t e c e s s a r y t l a g
t h d t c a r y t t h p o c d A t t m p t t
l f t t t m t t h g h m c h a l l
g d d b n d m t b b l B e c a s e f l l g t h p
t w d l d t b e l s e d t l l a x
w m d b e l o w T h p e w d t t h t f t h d
r y m w t h e n d w t h p u l t h k e s k
g r a f t f r o m t h t h g h

promptly treated. The exposed tendons either slough or become embedded in deep catarrh. The hand is particularly vulnerable to such injuries especially the dorsal surface where the coverings are thin.

Full thickness skin grafts are essential to good function in covering tendons. The grafts should carry a small amount of subcutaneous fat and areolar tissue. A free graft of this type does not take well when placed over exposed bone or tendons. A pocket flap should be used for the hand and a pedicle flap for the ankle, foot or knee.

For the sake of brevity we shall discuss one injury of this type, a wound involving the dorsum of the hand (Fig. 3). Meticulous surgical cleans and debridement are carried out and the injury is converted into a surgically clean wound free of devitalized tissue. The preparation is essentially similar to that described under deep scraping wound. Exposed nerve filaments should be carefully preserved.

For the donor site an area is selected in which the hand will fit comfortably without tension. The ante or abdominal wall or thigh is suitable. A flap is raised of sufficient size to fit over the hand and cover the wound. The hand is placed in this pocket and sufficient sutures used to anchor the flap firmly to the hand (Fig. 3 b). A few additional stout sutures are used to anchor the hand to the abdomen or thigh. Firm anchorage is most important. Movement of the hand under the flap is probably the greatest single factor in preventing a satisfactory result. Bulky dressings and adhesive striping give additional immobilization when the operation is completed.

One end of the graft is cut free in 7 to 10 days. The free end is trimmed and fitted to the wound and sutured with fine silk or dental. The other end is freed in 12 to 17 days and the final stages of fitting and suturing completed. The donor site can usually be closed but if necessary split thickness graft may be used to cover the defect.

Approximately normal function may be expected following this method of treatment. The procedure is equally applicable to secondary sloughs following injuries or burns provided infection is cleared up before a graft is attempted.

MISCELLANEOUS

In compound fractures of the forearm it is sometimes impossible to close the wound following operation. Relaying incisions must then be made lateral to the wound in order to bring full thickness skin and fascia together over the bone. The relaying incisions instead of being left open, granulate in may be covered with a split thickness graft (Fig. 4). The technique of application is similar to that described under scraping wounds. A graft of 0.014 inch is satisfactory. In this manner rapid clean healing is assured with minimum disfigurement.

In a dirty crushing or deep lacerated wound it is sometimes advisable to close the whole area thus converting it into a clean surgical wound. Following the incision it may be difficult or impossible to bring the edges to either a partial thickness graft taken from an adjacent area may be used to convert this into a closed wound. The technique is similar to that described except that in a deep or of greater care must be taken to bring the graft into contact with the underlying base. This contact is accomplished chiefly through suturing with fine silk and by the use of pressure dressings.

SUMMARY

Through the use of skin grafting many open wounds can be converted into closed wounds and thus primarily healed. Primary healing means a tremendous economic saving as well as decreased pain, improved function and superior cosmetic results.

To be successful all dirty wounds must be surgically clean before grafting is attempted. Grafts must be placed and held in firm apposition with the underlying tissues. The most common causes of failure in skin grafting are: (1) infection, (2) blood or serum pockets beneath the graft, (3) inadequate contact between the graft and the bed, (4) improper inadequate technique of the graft so that slow movement derails the healing process.

A variety of injuries are discussed in some detail and the methods of grafting best suited to each type.

DICUMAROL THERAPY IN POSTOPERATIVE THROMBOPHLEBITIS AND PHLEBOTHROMBOSIS

WILLARD H PARSONS MD FACS V ksb g M s ss pp

THE outlook in postoperative pulmonary embolism which was formerly regarded as an unpredictable unpreventable and highly fatal surgical complication has been completely altered within the last few years for two important reasons. The first is a changed concept of its etiology. The second is the introduction of effective prophylactic and therapeutic measures including ligation and division of the femoral vein and more recently the use of dicumarol.

It is still true that in all surgical experience there are few more ghastly accidents than the sudden death from massive pulmonary embolism of a patient who until the fatal episode has been progressing to an uneventful recovery. There is no longer any justification on however for the former concept that the catastrophe is a fatal bolt from the blue. It is not. It is now realized that in probably 95 per cent of all cases postoperative pulmonary emboli which terminate fatally have their origin in thrombosis often without an associated inflammatory factor of the superficial or deep veins of the lower extremities.

Both the incidence and the causation of postoperative thrombi are still matters of debate. On the surface at least geography seems to have something to do with the incidence. Thus Allen Linton and Donaldson report a very high frequency in Boston while Ochsner and DeBakey report a considerably lower incidence in the South. What is important however is that wherever the condition has been properly studied the incidence has always been found to be much higher than as once believed or than is believed and taught in many circles at the present time.

The incidence of postoperative thrombosis regardless of the locality is almost certainly related to the proportion of necropies secured. Whenever the proportion is high there is a correspondingly high incidence of thrombosis of veins of the lower extremities and of pulmonary infarction and fatal pulmonary emboli. When the percentage of necropsies is low the incidence of venous thrombosis and pulmonary infarction and of fatal pulmonary emboli is correspondingly small.

For the past 5 years I have been able to obtain necropsies in about 75 per cent of all fatal cases on my own surgical service and I have observed—on more than one occasion to my amazement and chagrin—a relatively high incidence of pulmonary embolism and of antecedent venous thrombosis. My experience in this respect I am sure is not unique.

Although there is no general agreement as to all the causes of venous thrombosis certain causes are established including (1) improper handling at operation of the viscera and their venous supply (2) confinement to bed with consequent inactivity of the limbs and in turn slowing of the circulation (3) some alteration of the normal blood clotting time the nature of which and the reasons for which remain to be elucidated. The complication is most often observed after surgery particularly upon the pelvic organs and pelvic infection either antecedent to or subsequent to operation unquestionably is an important cause. It should be emphasized however as the following case illustrates that a nonpelvic origin is not infrequent and that surgery does not necessarily precede the development of pulmonary embolism.

C M J H (H 3873) o w m s y f
ag b m t t d t h t t l t h y d t m y f t x c o d l
g t A m b 943 Sh w d a c h g d g o o d
d t 7 d y l t l t t l y N b
m l t e w b d t t t h f i t p t p t e
x a m t w m b s b t t t h s d m t u
v m b 4 l l g f t h l f t l o w t e m t y w s
t d d b y D e c m b l t t h r m p h i b u s
h a d l p d R t m a s w m s t t d d
f l l d b y c m p t t e c y p t f d l
d m w h h l d s a p p e d f t p r a t b l o c k
f t h t t f t h f t l m b g l r a t b l o c k
3 d M h 944

C D W S (H 46) g m l y f g
a s f t e A p r i l 8 944 o t h m d l r v f d
v K P L s F t h p a s t m t h h d h d h d d
h t l d t h h p o d t u t h t d h d l t
4 p o d R o c t f f l o p m t f t h t
m d b l t f d m d p l m y t b u l o s d
m t u f t h p t m l e d f t b a r i l A p r i l
9 h l t h w a t g o o m t h p t d d l y d
l p e d y o s d d y s p e a p a s s e d t t a t f h o c k
a d d e d h r a l t h a g f a i l d t r e s p o d t l l
t h r a p e t m a s s u r N e c p s y n f i r m e d t h d a g o s f
t b l a t l p l m n a r y t b e c u l o s d d l d
t h m m e d t c a f d e a t h t b e p l m n a r y m b o l m
t l o c a l d t h r o m b o s i s f t h r i g h t f m r a l d
m h p l p l m n a r y n f a r t s f m p m b o l

From the V ksb g Cl V k b r g M s s p p R d b
v i t a b e f r e t h P L C o t y M e d I S o c i t y 4 g u t s 944
t f C o m b M i s s i s s i p p i

Thrombosis (whether the bland thrombosis of Homans or the phlebothrombosis of Oschner) should be borne in mind as a possibility following any operative procedure and should be immediately presumed to exist if several days following surgery there is unexpected or unexplained low grade fever or if there is tenderness in the calf of the leg on dorsiflexion of the foot (Homans sign). These two phenomena are sufficient for diagnosis. Phlebography is not essential; it is sometimes useful but it may be very unwise.

When thrombosis or thrombophlebitis has been diagnosed or is seriously suspected exploration of the femoral vein is a wise precaution. If pulmonary infarction has developed it should be carried out without delay. Although a highly effective procedure exposure and exploration of the femoral vein with removal of the clot by suction are minor in their scope present no surgical hazards give rise to no complications and can be safely and quickly carried out even on a very ill patient.

DICUMAROL THERAPY

With this plan of treatment itself of fairly recent development should be combined the administration of dicumarol controlled by daily determinations of the plasma prothrombin time. The effectiveness of these measures is illustrated in the following case report.

C 3 R H w h t f m l S y f g b m t t d
t a m p l t h y t t m y f t n f i b l m y m d
a n d c a l o s J f 9 4 4 S b t t s c h g d
g o o d d t J l y f t t f t y b t
w h o s p i t a l i z d J l y d b f p l m t u p p
t h d f t h l f t t h j u s t b l w p l m t h o
c t d w t h l i g h t l l g d l f t m d d g i t h k
t h f t d T h l f t m l
d t l y s p o d d p d l t 8 b l g t b
m d d d t h w t h i g t d d d d d
D m d l t h p y d l b t y t l d
n u t d t l J l y d t h p u t w d s c h g d
t h f l w d y m p l t l y d

Thromboses of the veins of the lower extremities can be prevented in most cases by certain precautions at operation and following operation. At operation on all manipulations should be non-traumatic and the heel should be supported by the venous supply. After operation circulation should be maintained in the lower extremities by keeping them warm by the use of electrically heated blankets with the bicycle apparatus and in older patients by the application of a hot water bag. The physical condition of the patient is of value as the following general points indicate:

C 4 M R H (H 5-o) wh t f m ? 39y
f b m t t d t t t l h y t t m y f t

fib l my mas J ly 944 p phylacti ppe der
l my mas l per d m d Beca f akly fear
f l f p lm ry mb l m f hu h tw l se l t
b d d d f ll g pe t d m l g for 6
d y b f pe t th d y f pe t d f 3 d vs
f tw d R ry mas mml t l tful

The case is somewhat similar to a case in Zucker's series in which dicumarol was used prophylactically because the patient had a previous history of thrombophlebitis in pregnancy. One sister had died of postpartum thrombophlebitis and a second sister required amputation of the lower extremity for the same reason.

The discovery by Schofield of the part played by spoiled sweet clover in the hemorrhagic diseases of cattle was followed by the isolation and synthesis of its active principle dicoumarin and by the prophylactic and therapeutic use of this principle under the commercial name dicumarol. Although reports in the literature are still few the evidence seems no doubt of the effectiveness of this anti-coagulant. Barker and Hassel states from the Mayo Clinic who tested prophylactically over a 3 year period in 1943 published their results in 1997 cases. In 75 of these cases on the basis of existing statistical data thrombosis or embolism might have been expected to occur in 44 fatalities from embolism might have been expected. The conditions however helped in only 4 in that cases none of which terminated fatally. Zuckerbros recently reported 8 cases in which dicoumarol was used therapeutically and in 9 instances of thrombophlebitis of the lower extremities and 2 instances of postoperative pulmonary infarction of the patients made complicated recoveries.

complicated procedures. The rationale of this form of therapy reduced to some rather oversimplified terms may be stated as follows: The combination of a subsequent embolism or gangrene of the leg, either of the factors a patient died because the mechanical blood clots got too efficient. The self-dissolving, debride attempt to educate the efficacy of this mechanism to the lower limit of safety by the administration of an anticoagulant and correct blood conditions versus a tamponade. The plan of therapy is to administer a final dose of 0.03 to 0.06 milligram of d-cumol followed by daily doses of 0.01 milligram as long as necessary to maintain the plasma prothrombin time within 3 to 6 percent of normal. Observations at the Mayo Clinic by Hurn and her associates indicate that thrombosis will almost certainly not occur if the prothrombin time is kept under 27 seconds and the blood is essentially free to occur for the administration of d-cumol if the prothrombin time is less than 60 seconds.

Their policy is to use 35 second as an arbitrary standard when the prothrombin time is longer than 35 seconds dicumarol is administered and when it is less the drug is omitted.

Zucker call attention to the importance of the tendency (slope of the plotted curve) of the plasma prothrombin time which is equal to the importance of the absolute level. The time may be excessively and dangerously lengthened if an additional dose is given while the percentage of normal is decreasing but there may be escape from the desired range if a dose is not given while it is increasing.

Dicumarol for either prophylactic or therapeutic purposes is absolutely contraindicated in purpuric disease of any type in blood dyscrasias with a bleeding tendency in renal insufficiency and in hepatic disease with which a prothrombin time deficiency is frequently associated. Even when these contraindications are observed however bleeding is always a possibility. It occurred in 47 of the 497 cases reported by Barker and his associates though in only 18 of these in all of which it was readily controlled by transfusion. It was apparently related to the anticoagulant therapy. In Zucker's series of 18 cases 5 patients presented microscopic hematuria in one instance associated with a petechial rash. In the latter case the rash developed while the prothrombin time was 18 per cent of normal and in 3 of the other cases hematuria developed while the prothrombin time was less than 30 per cent of normal.

The speed with which the prothrombin time may be extended to dangerous level is well illustrated in a personal case.

C S C S (H 4 8) h i m 4 3 f
 p b m t d t B h p l t y J 7 944 f
 f l g l f t d t g u n a h R y w
 m o o t h t l J w h d d l l p o c d
 t d t l p d l p d p f w t
 A l t h h y o c l f s t d d a p
 b i t y t h p f p l f t b t h l
 d o r p h d t d t t h b m d
 d a g o s i p l m n a y f c t m d
 d m l t h p y t h f b g t h t
 d o s a c f 3 m l g r m O t h f l d y J m l
 g m t d m l l g m w g J 7
 t h p t i p l m p t h n b t m d 5
 (m l s d) J 6 d 36 d (m l
 s d d) J 7 A l t h h f t m d i
 d m t d t h p l m p o t l m b t m o s t 46
 s e d (m l 7 d) J 1 5 d (m l
 3 d s) J 9 d i d (m l s d)
 J 3 i m A l 4 (i h d i b
 t m l r s (0.4 m g m) f h y h (t h i 1 m k
 A b b o t t) K B y t h l m p t h m b
 t m h d f l l 4 5 d (m l 7 d) d 3
 h r s t t h d i l t j d (m l s d)
 d t d y f t h p t i O p d f i d m f
 t h l f t l g a s d m 1 d O t f l l g d y d m

w d f i n t d w a t d t h t d t h
 f t h l f f m l T h w p d d
 d J 8 l t 4 h l g t h w m d d
 t h w t h l g a t d d d d R y f t t h
 t u n f t l d g l y p l g d p t h m b t m
 w u t f l d t h p t e t w d h g d g o d
 d t n J u l y 4 944

The speed with which the prothrombin time in this case rose to dangerous levels and the rate at which it continued to increase for 72 hours after the drug was discontinued suggest that the patient was particularly susceptible to dicumarol. The even greater speed with which it returned to a safe level after a single administration of synthetic vitamin K suggests that this method is probably even more effective than transfusion which is usually advised.

It should be noted that in this case the thrombophlebitis followed rather than preceded the development of pulmonary infarction or more correctly became evident after the development of pulmonary infarction. It should also be noted that it became manifest while the patient was under treatment with dicumarol. Zucker who recorded a somewhat similar instance regards the development of the venous thrombosis under such circumstances as evidence of the safety of dicumarol therapy though it also he believes raises the question as to whether hypoprothrombinemia achieved by dicumarol is sufficient to inhibit intravascular clotting.

Dicumarol therapy is potentially dangerous and the necessity of laboratory control by daily plasma prothrombin determinations cannot be over emphasized. The possible risks are illustrated in the personal case just described (Case 5) and are more tragically illustrated in the fatal case reported by Sh Levin and Lederer. Their patient a white woman 79 years of age was first seen 4 weeks after she had been admitted to another institution for thrombosis of the right retinal vein for which she was treated for 21 days with daily doses of 100 milligrams of dicumarol. During this time no plasma prothrombin determinations were made although the coagulation time was reported as 20 minutes. Dicumarol was discontinued 4 days before the patient was first seen by Sh Levin and Lederer when bleeding from the gums had occurred. It had persisted and had been associated for 3 days with hematuria.

The patient was given 7 transfusions after the first 3 of which coagulation was temporarily controlled. The plasma prothrombin time which was 60 seconds (control 12 seconds) when the patient was first seen rose to 360 seconds plus (control 13 seconds) on the 8th day of hospitalization after the 4th transfusion and was 84 seconds (control

12 8 seconds) when it was last determined. Acute left heart failure developed after the 2nd transfusion and anuria on the 4th day was succeeded by incontinence, lethargy and coma. Death occurred on the 14th day. At this time there were ecchymotic areas on shoulders, hips, legs and about the anus. The outstanding feature of the necropsy findings was marked engorgement of all blood vessel except the larger trunks; it was most pronounced in capillaries, arterioles and venules.

This case apparently the first of the kind to be reported carries its own lessons and makes clear that too many precautions cannot be taken while dicumarol therapy is being administered. For this reason it seems well to mention the recent warning by Hurn and her associates that thromboplastin is distinctly variable under certain conditions and that each new batch regardless of the similarity of preparation should be checked since the results of the prothrombin time test depend to a great extent on the activity of this agent. As these workers point out when the Quick test was first introduced all information desired was whether or not the prothrombin time was prolonged. With dicumarol therapy however the patient's safety depends upon knowledge of the exact amount of deficiency hence the necessity of checking the activity of thromboplastin used in the test.

On the whole dicumarol is a more practical drug for general use than heparin which was formerly the only effective anticoagulant available. It can be given by mouth whereas heparin must be given intravenously which is always a disadvantage for the patient and which is often inconvenient in these days of shortages of hospital personnel. It is much cheaper than heparin which is almost prohibitively expensive for the majority of patients. It is also safer than heparin in the opinion of some observers because of its comparatively low toxicity. On the other hand dicumarol requires from 4 to 36 hours to take effect whereas heparin acts almost at once when heparin is

that in a certain small proportion of cases heparin rather than dicumarol is the preferred drug.

SUMMARY

Pulmonary embolism is prevented in the great majority of cases by the embolism of the veins of the lower extremities which can usually be prevented by the proper precautions at operation and afterward and which can be treated by removal of the clot from the femoral vein with subsequent ligation and division supplemented by the administration of dicumarol. Dicumarol is also a valuable prophylactic measure.

In spite of its effectiveness dicumarol the essential effect of which is to lengthen the clotting time a very dangerous agent which should never be employed without adequate control in the form of daily estimations of the plasma prothrombin time.

If the plasma prothrombin time becomes dangerously lengthened as may happen even in properly controlled cases in a subject peculiarly susceptible to the drug the administration of a vitamin K preparation or transfusion is indicated and seems promptly effective.

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THE EFFECT OF DIHYDROTACHYSTEROL ON CERTAIN TOXEMIAS OF LATE PREGNANCY

WALLACE SHUTE Capt n R C A M C and EVAN SHUTE BA MB F R C S C
Lond C nad

PROPHYLACTIC control of pregnancy toxemias in the last dangerous trimester has proved a very complex problem. No treatment can be adequate however ingenious if it fails to eradicate their cause. Etiological exploration to date seems to have progressed along four main approaches (1) endocrines (2) placental toxins (3) kidney factors (4) chemical or organic poisons from other sources. Prophylaxis has not waited however for a completed knowledge of etiology and many workers have stressed the value of vitamins and better food in preventing toxemias or alleviating their symptoms.

In 1910 Mitchell made the observation on empirical grounds that an inadequate complement of calcium was a predisposing cause to the toxemias of pregnancy. Morel and Rathery found that a lowered detoxifying function of the liver followed parathyroidectomy and the resultant derangement of calcium metabolism. The liver of course is one of the principal sites of attack in eclampsia and other late toxemias of pregnancy.

Lopez found in his toxemia series that prompt improvement followed injections of Collip's parathyroid extract with diuresis and a decrease in blood pressure, edema and subjective symptoms ensuing. In none of these was there any significant coincident increase in the blood calcium level.

Richardson reported complete symptomatic recovery of two pre-eclamptics who were given parathormone intramuscularly and calcium and viosterol by mouth. Blood pressures of 150 and 160 respectively dropped to normal level and even a two plus albuminuria disappeared rapidly.

Daly claimed similar dramatic results with the oral use of tablets containing a calcium salt combined with the intravenous administration of a corresponding preparation. He made the interesting additional observation that only 11 per cent of his treated series were delivered prematurely as against 63 per cent of the controls.

J. C. Brougher reported a series of 88 to 90 patients occurring in a total of 1000 pregnancies. Of the 341 blood pressures of 50 mm or a drop with varying degrees of ankle edema, albuminuria and definite toxemic symptoms. The

remaining 54 had pressures from 140 to 150 only slight ankle edema and traces of albumin—no other toxic symptoms. Parathormone in 1 cubic centimeter doses was used to elevate the serum calcium. In each case diuresis occurred with prompt loss of edema, general weight loss, lowering of blood pressure and a recession of toxic symptoms.

Theobald treated 50 healthy women less than 6 months pregnant with daily doses of 20 grains of calcium lactate as well as 11,000 international units of vitamin D. Only 7 of these developed hypertension as against 17 in a group of 50 controls.

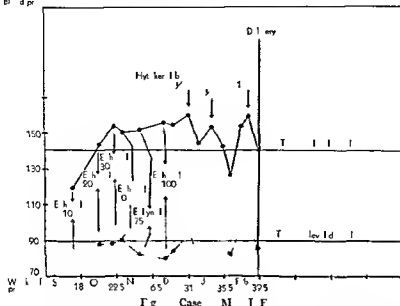
Similarly Mendenhall and Drake found in a group of 188 women given calcium orally that toxemia developed only twice (1 per cent). In a group of 230 controls fully 30 became toxic (13 per cent).

It has been shown (Albright and associates) that though parathormone increases phosphate excretion and mobilizes calcium, it does not aid in calcium absorption. Conversely dihydrotachysterol (A.T. 1) plays an active role in increasing calcium absorption from the gastrointestinal tract although it is less effective than parathormone in promoting phosphate excretion.

By means of blood estrogen estimations we have found (12) that toxemic women fall into two main groups, namely (1) those exhibiting a high blood estrogen level characterized by either a tendency to abortion or miscarriage or abruptio placentae or premature labor (2) a much smaller group with normal or low blood estrogen values who being true pre-eclamptics may run almost the whole gamut of pregnancy very well to all outward appearances only at the end to fall over the precipice of convulsions. In the experience of the authors women belonging to the first group very rarely convulse the latter are always potentially capable of doing so.

The great majority of the first or high estrogen group of toxemic women respond to vitamin E prophylaxis satisfactorily throughout pregnancy (1). A certain small percentage of them however either do not respond perfectly at any time to such treatment or seem to escape from such

Bl d pr



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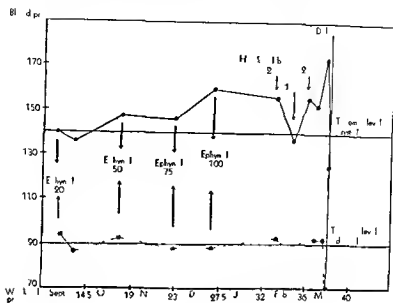


Fig 3 Case 3 Mrs D K

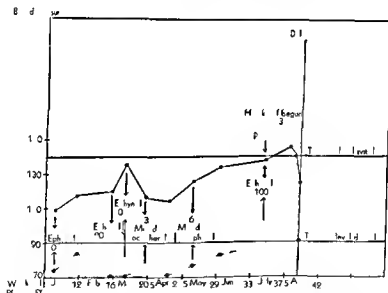


Fig 4 Case 4 Mrs W B

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 h d l b m e d m H b l o o d e s t b e 46/9 t h m o d t l g e d m a n d a l b u m i n u r i a L a t e r
 p o t i h w p t l a g d f p h y n l t d

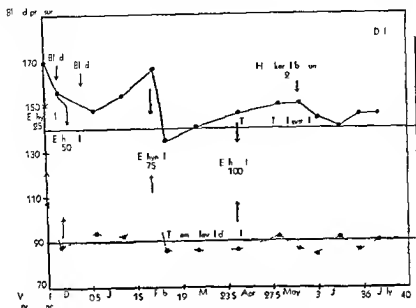


Fig 5 Case 5 M A J H

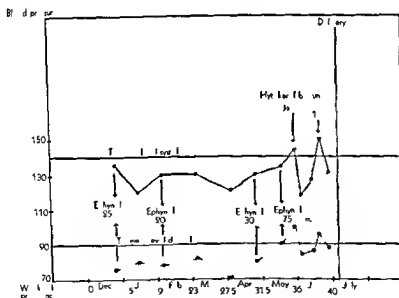
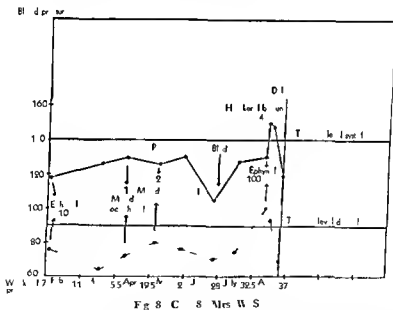
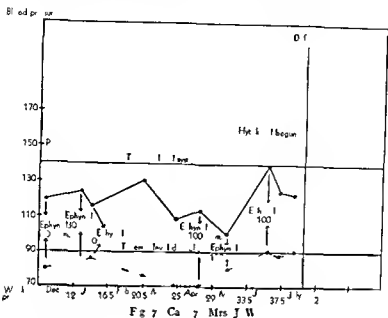
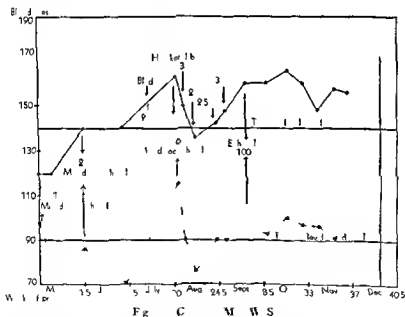
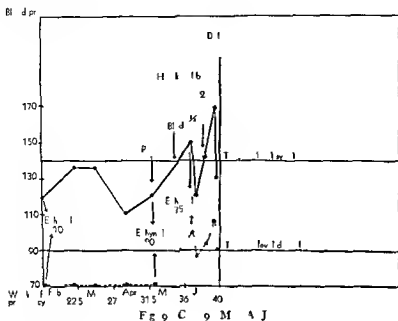


Fig 6 Case 6 Mrs R L

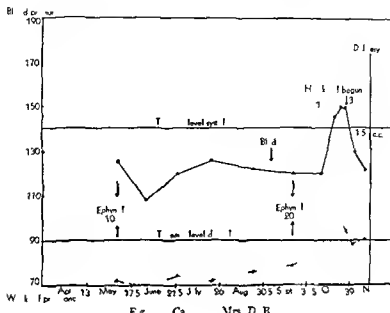
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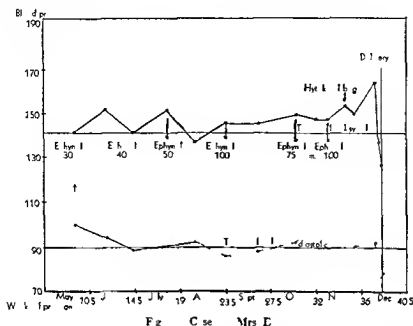


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g l a t J d h t m E th g e d t
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DISCUSSION

In this group of 42 refractory toxemia patients studied over the past 2 years, 6 or 38 per cent showed definite benefit on combined calcium and dihydrotachysterol administration, 14 per cent showed a slight or transient benefit, and 48 per cent were unimproved. The improvement was most evident in blood pressure but even a de-

crease of albuminuria and edema occasionally was noticed.

In the earlier cases of the series dihydrotachysterol was given with extreme caution in an attempt to achieve the optimum level of blood calcium without elevating it dangerously. When small doses were thus used the improvement obtained was neither as immediate or decisive as in later patients of the group who were treated with larger amounts. In no instance even when our highest dosage was employed namely 5 cubic centimeters per day did untoward symptoms develop. The maximum quantity of the synthetic hormone used was it should be noted considerably below that recommended for replacement therapy in the hypoparathyroid state. No cumulative effects were observed.

The advantages of the use of dihydrotachysterol in the pregnant woman are manifest. Its ability to increase the absorption and utilization of exogenous calcium spares the already menaced endogenous supply available in the bones and teeth. Hence it provides in these critical cases a much safer and more physiologic mode of therapy than the use of parathormone.

Most observers employing calcium or parathormone or both in pregnant women have remarked on the astonishing uniformity of blood calcium levels during treatment even with large doses of the hormone. It would appear that in normal and near normal individuals so stabilized is the equilibrium between conjugated and ionized

calcium that to produce an elevation in blood calcium an exceptional dosage is required. More over as Klatskin points out any excess of calcium or of phosphorus absorbed is excreted so rapidly that transitory variations in blood calcium level are rapidly leveled off. Reed states categorically that there need be little apprehension for example about administering amounts of parathormone up to 150,000 international units for indefinite periods of time.

How then does dihydrotachysterol combined with calcium affect the toxemias of late pregnancy? From the aforementioned findings it appears that it leaves true pre-eclampsia clinically unchanged and benefits only some toxemic patients of the high estrogen group. Most women in this latter group respond fairly satisfactorily to the action of vitamin E as we have shown elsewhere (15). But dihydrotachysterol is of great value in that important small fraction of the high estrogen late toxemias incompletely controlled in this manner by means of vitamin E.

No attempt is made at this time to explain the underlying mechanism of combined dihydrotachysterol and calcium therapy in the toxemias.

Its principle impact seems to be directed mainly upon the pressor factor. At least this treatment should be safer than parathormone in controlling the calcium factor in late pregnancy toxemias.

SUMMARY

The effect of combined dihydrotachysterol and calcium therapy is demonstrated on a series of 42 toxemias.

This therapy did not improve 4 true pre-eclampsias but definitely helped 4 per cent of 38 late toxemias of the high estrogen type which had not been controlled by vitamin E.

3 This differential response lends further support to our previous classification of the late toxemias.

4 This therapy appears to be most effective in lowering blood pressure and less in the control of edema and albuminuria.

5 Variations in blood calcium level were small in this series but the dose of dihydrotachysterol used was never more than 5 cubic centimeters per day.

6 This dosage is considerably below the level of replacement therapy in hypoparathyroidism and produced no toxic effects.

7 The use of dihydrotachysterol would appear to be a more physiologic and hence safer method of increasing calcium utilization to emic women than the administration of parathormone.

8 No explanation of the mode of action of this treatment is offered.

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3 Id. m. Am. J. Obst. 94 4 40
4 Id. m. U. t. C. t. R. 94 4 3
5 Id. m. J. Obst. Gyn. B. t. h. Emp. P
6 THE. LD. G. W. LA. t. L. d. 937 3 39

EARLY RISING FOLLOWING MAJOR SURGICAL OPERATIONS

PAUL W. SCHAFER M.D. and LESTER R. DRAGSTEDT M.D. Chicago, Ill.

EARLY rising of patients after major operative procedures has since the enthusiastic report of its first advocate in 1899 (4) attracted the attention of many surgeons. A recent review by Newburger adequately summarizes their observations. Interests in enough those who have given this principle an extensive trial have almost uniformly been favorably impressed and many have loudly acclaimed its virtues. In general critics of the practice have self-admittedly had little experience with it and have based their criticism on one or a few unfortunate complications which may or may not have been justifiably attributed to early rising. In spite of the fact that the medical literature mainly European contains reports of many thousand of favorable cases, only in the past few years that any significant amount of attention has been given the subject in this country. This seeming paradox exists because early rising of patients after operation is the exact contradiction of one of the most deeply rooted principles of patient care. Early rising of patients with early and rapidly increasing ambulation together with coughing and breathing routines is not here being advocated as a substitute for but as an adjunct to the generally accepted and proven features of surgical technique and preoperative and postoperative care. Indeed early rising is now possible only because of improvement in surgical technique with gentle handling of tissues, accurate reconstruction of wound, strict asepsis and antisepsis, adequate general and local preoperative preparation, good anesthesia, prophylactic and definitive decompression of the stomach and intestines, retraction and maintenance of fluid balance and recognition of the importance of blood and plasma loss which must be replaced by adequate transfusion. Undoubtedly in the past attempts at early rising and ambulation of patients occasionally met with failure because the care of the patient was otherwise inadequate.

It was with considerable hesitation that we began to test the principle on patients who had had some of the following surgical procedures:

The first case was that of a 68-year-old female with a long history of heart failure, who had been in bed for several months. She was operated on for a large abdominal tumor. After the operation, she was able to get up and walk within a few days. This was a remarkable improvement over the usual practice of keeping patients in bed for weeks.

Soon after this favorable experience more and more patients were subjected to the same routine. Since enthusiasm mounted within months all patients on the service were out of bed on the second postoperative day. The 102 cases summarized in Table I represent the basis for this report.

As may be seen in Table I the series includes most of the usual general surgical operations. It is made up of patients who without selection presented themselves for surgical care from February to September 1944. Since October 1944 many more patients have been treated early rising but are not included in this communication. The general management of these patients and

From the Department of Surgery, University of Chicago, Chicago, Ill.

TABLE I—SUMMARY OF POSTOPERATIVE OBSERVATIONS ON PATIENTS EXPERIENCING EARLY RISING FROM FEBRUARY TO SEPTEMBER 1944

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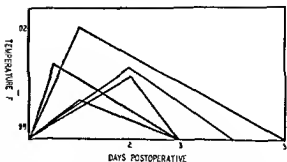
specific surgical techniques were in no way altered with the institution of this program. Abdomens were operated on through a variety of incisions with oblique and transverse approaches being most commonly used. All peritoneal sutures were of a continuous type usually a double strand of either No. 00 or No. 0 chromic gut being used. Closure of the fascia was usually made with continuous suture of either No. 00 or No. 0 chromic gut re-enforced with interrupted sutures of No. 0 chromic gut placed 2 to 3 centimeters apart. Interrupted No. 000 plain gut sutures were used for the subcutaneous fat and cutaneous black silk for the skin. A gridiron incision was routinely used for appendectomy. Hernia repair followed the general pattern just mentioned. No abdominal prosthesis was routinely used although in cases which were likely to require frequent

dressings an adhesive type corset was employed. Early rising was begun at some time during the first or second postoperative day and rapidly increased thereafter.

It is difficult to convey the extremely favorable impression which has been made on us by this radical departure from a firmly entrenched routine of postoperative care. This difficulty lies chiefly in the fact that the benefits which result are of a nature which do not easily lend themselves to conversion into letters, numbers or symbols which may be charted or made into graphs. The danger of description is an adequate substitute for the personal observation of these patients. They possess a excellent morale which improves day by day as they are freed from the burden of apprehension and fear and imagined complications which beset a person no

familiar with the ways of medical practice. Because of early exercise the marked weakness felt by the patient who leaves his bed on the tenth or twelfth postoperative day is greatly minimized. Early rising allows the patient to take over the management of his own personal hygiene at an early period and thus greatly reduces his nursing requirements. In this series patients have not been discharged from the hospital as early as their condition would have permitted since an opportunity to observe them closely was desired. However their hospital stay can be materially shortened as a result of early rising. This represents a financial saving to the patient and because of the more rapid turnover allows hospital care for a larger number of patients with existing hospital facilities.

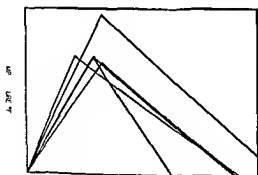
Probably the most important result of early rising is the prevention of many minor and major pathological pulmonary changes. Following operations within the abdomen especially procedures in the upper abdomen and as a result of maintenance of the horizontal position the diaphragm is reflexly inhibited and assumes an abnormally high position. This factor results in basal pulmonary atelectasis with all of its hazardous potentialities. Clinically this condition is evidenced by shallow rapid respirations, increased pulse rate, basal suppression of breath sounds, dullness and rales. These changes have been observed so constantly in the first few postoperative days that they have become accepted as the normal postoperative course and all surgeons are familiar with the postoperative hump in the TPR curve. Leithauser has



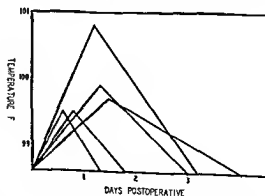
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shown that with early rising the vital capacity returns to normal in half the time required by the bed confined postoperative patient (1).

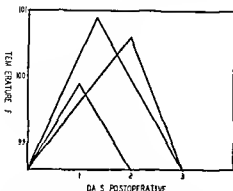
In this study the problem was approached by a comparison of the postoperative temperature records of early rising patients with those of bed confined patients. Forty early rising patients' records were compared with those of one hundred bed confined patients cared for by the four other general surgical services of the clinics. The results may be seen in the accompanying graphs (Figs 1 through 5). In practically every instance the early rising patients had a lower maximum temperature elevation and resumed a normal temperature level sooner than did the bed confined patients. Clinically this freedom from prolonged fever was closely correlated with improve



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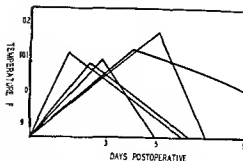


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ment in the character of respiration. Others have claimed for this routine a lessened incidence of thrombophlebitis, phlebothrombosis and embolism (2) but since these complications are relatively rare in this area no valid information can be obtained from this series in which none of these complications was observed. It may be that early respiration would be an adjunct to or possibly a substitute for vein ligation which is practiced in the Atlantic and Gulf seaboard states in which localities these complications are common.

Almost the only consistent criticism of early respiration is that it might mechanically damage the wound and result in delayed healing, postoperative herniation or dehiscence. From observations made on these 3 patients there is no basis for such criticism. In the entire series only four significant complications have been encountered. Two were fatalities and two were late herniations and in no case is there good evidence that the same complications would not have occurred if early respiration had been omitted. No significant pulmonary complication occurred in any one of the 103 cases.

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SUMMARY

In summary the early rising of 03 general surgical patients has been observed and has resulted in a uniformly favorable impression of the practice. Improvement in the general well being of these patients over that of bed confined patients has been discussed. With early rising there is improved morale avoidance of asthema more patient self care and less nursing care less financial loss to the patient because of shorter hospitalization and earlier rehabilitation and because of

more rapid turnover more patients can be cared for with existing hospital facilities and personnel. Early rising patients have been shown to have a lower postoperative fever of shorter duration than the bed confined patients of four other general surgical services. This factor in our opinion is closely related to observed improvement in respiration. The record of complications presented here compares favorably with the number of complications observed in a similar group of bed confined patients.

REFERENCES

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EDITORIALS

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1 c les

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JULY 1945

1905-1945

THIS issue marks the beginning of the forty first year of SURGERY GYNECOLOGY AND OBSTETRICS founded in 1905 by Franklin H. Martin. It was his conviction that there was a real need for a surgical journal which should appeal to practical surgeons to be edited by active surgeons the profits from which should be utilized in strengthening its worth and influence.

He was aided by a small group of young surgeons who had been intimately associated with him in the course of their surgical training by Mr. T. E. Donnelley of R. R. Donnelley & Sons Company a friend of long standing and a nucleus of men and women who have loyally and conscientiously carried out the many sided tasks of great magnitude which are so vital to the success of such a publishing venture. The unflinching interest and enthusiasm of this original group who believed in Dr. Martin's dream and their steadfast devotion to the ideal of creating a surgical journal second to none which was firm within

the heart of each of them are responsible for the success of SURGERY GYNECOLOGY AND OBSTETRICS. The direction of its business affairs the assembling and composition of the material presented the quality of its typography and reproductions the conduct of the daily affairs of this journal have all represented throughout these years the contributions of the personalities chosen to carry out these many activities. It has been their gifts throughout the years which have made of this journal more than an ordinary commercial enterprise.

The editorial policy from the first was created and carried out by Allen B. Kanavel whose idea it was that the journal should constitute a forum wherein the ideas and accomplishments of men in the surgical world could be presented without any imposition whatever of the belief or opinions of the editors. The journal vouched for the honesty and sincerity of the authors whose work it published but left for its readers and time to establish the correctness of their views. All editorial comment and book review have always been published over the signature of the author upon the basic principle that the reader has a right to know the source and may assume that what he reads is a well considered statement of opinion.

With Mrs. Martin's death the direction of SURGERY GYNECOLOGY AND OBSTETRICS passed into the hands of the Board of Regents of the American College of Surgeons another of her husband's contributions to the surgical progress of this country. The journal will continue to attempt the fulfillment of Dr. Martin's conception of a surgical journal and will devote its pages to the contributions of prac

tical surgeons edited by active surgeons with any and all profits derived from its circulation and advertising matter utilized for the creation of an increasingly better production

LOYAL DAVIS

SUBDURAL HEMATOMA

SUBDURAL hematoma was once considered a rare condition and of only pathologic interest. Actually it is one of the important indications for surgical intervention after craniocerebral trauma. Virchow originated the concept that subdural hemorrhage was secondary to some inflammatory process of the dura and gave it the name *pachymeningitis interna chronica*. Numerous reports have presented various etiologic causes notably lues alcoholica, curvy and infectious diseases. It was not until Trotter's report in 1914 that the condition became of interest to surgeons.

Contrary to the concept that inflammation is the primary etiologic factor is the concept that the primary lesion is a hemorrhage. The hemorrhage is not necessarily traumatic. Russel and Cairns reported four cases of carcinomatosis and sarcomatosis of the dura with formation of a subdural false membrane. Neoplasm or vascular malformation may be a predisposing factor. The writer has had a case of subdural hematoma overlying a glioblastoma of the temporal lobe and another overlying a venous angioma in the same location. Both of these patients had suffered a mild head injury before the onset of any symptoms referable to an intracranial lesion.

An essential question is the primary location of the bleeding—whether subdural or intradural. Baker, Hannah, Kaump and Love have presented histologic evidence to indicate the intradural origin of these hemorrhages. On the other hand Leary pointed out that in the early stages of encapsulation of

free blood in the subdural space the neomembrane or capsule forms first on the dural side and later on the arachnoid side and that the neomembrane on the dural side is always in a more advanced stage of development than on the arachnoid side. Surgical observations on subdural hematomas in various stages of development substantiate Leary's statements.

The mechanism of the progressive enlargement of the clot is a matter of considerable dispute. All are agreed that there is progression in the development of the clot. Massive acute subdural hemorrhage does occur in extensive injury (laceration) of the brain. These cases have early and marked symptoms and usually result fatally. The onset of the subacute or chronic case is slower and often insidious. The initial brain injury is relatively insignificant or if more severe the patient recovers from it.

Gardner, Leary, Munro and others have assumed that the initial lesion is the escape of blood into the subdural space. As the result of a fall or a blow to the head the brain is displaced in the cranial cavity. This may cause tearing of a vein crossing the subdural space. Recently this has been demonstrated experimentally in the monkey by Craig, Sheldon and Pudenz who have been able to take motion pictures through a lucite calvarium of such a hemorrhage following a subconcussive blow to the animal's head. Usually it is a superior cerebral vein that is torn but inferior veins to the sphenoparietal or transverse sinuses may be torn. In any case rupture of a vein as it crosses the subdural space allows the escape of blood into that space. The venous pressure in the cerebral veins is low and the bleeding usually soon stops spontaneously. A liquefaction of the blood in the subdural space begins the resultant fluid is high in protein content. Since it is separated from the subarachnoid space by only the arachnoid (and

later the newly developing neomembrane on the arachnoid side) and since this is impervious to the large protein molecules in the liquefying blood an osmotic imbalance must exist between the cerebrospinal fluid and the liquefying blood with resultant passage of fluid into the subdural space. As time goes on and the hemoglobin molecules begin to break down there is a great secondary increase in molecular concentration following the breaking down of the large protein molecules. Consequently there is a late secondary tendency to increase in size of the clot. The dura reacts early to the presence of the blood in the subdural space and a neomembrane or capsule forms first on the dural side. Later a more gradual reaction of the arachnoid produces a neomembrane on the arachnoid side of the clot.

Most subdural hematomas are on the lateral aspect of the hemisphere. Some are inferior and anterior others posterior and inferior. They are progressive expanding lesions and must be treated surgically. A burr hole in the parietal region above the ear will disclose practically every clot. Most of them can be satisfactorily evacuated through single or occasionally multiple burr holes. Only rarely is it necessary to reflect an osteoplastic flap. Since the clots are often (12 to 15%) bilateral a burr hole should be made on each side in every case.

In 75 consecutive patients who were operated on a history of trauma was present in all but three. At times the trauma is so slight that it is overlooked by the patient particularly if a considerable time interval intervenes between the trauma and the appearance of the symptoms. This interval may be brief or it may range up to several months. Time intervals of a year or more raise the question of a second later but forgotten injury.

Mental disturbance is the most outstanding clinical symptom and was noted in over 90 per cent of the cases. The picture is usually one of progressive confusion finally advancing to stupor or coma. Very often the condition fluctuates markedly. One day the patient is grossly confused or stuporous the next relatively alert. Occasional dramatic recoveries from apparently terminal coma may be stimulated by administration of a hypertonic solution of glucose or sucrose intravenously or by spinal drainage. Unfortunately if the true condition is not recognized the physician is lulled into security but soon the patient lapses into a stupor that is permanent and ends fatally.

Neurologic abnormalities in the form of hemiparesis or paralysis, abnormal reflexes or some degree of aphasia are very frequent. These findings often do not appear until late in the development of the condition. Headache, dizziness or nausea and vomiting are common.

The spinal fluid is xanthochromic in two thirds of the cases. Clear spinal fluid does not rule out the presence of a hematoma or even make it improbable but xanthochromic fluid usually indicates the diagnosis. However subarachnoid hemorrhage is often present in brain injury and if the antecedent trauma precedes the spinal puncture by less than two weeks the xanthochromia has to be disregarded. Observation of the spinal fluid findings in a large number of cases of traumatic subarachnoid hemorrhage has convinced us that the spinal fluid will be clear within 12 to 14 days after a brain injury.

Papilledema is found in one half of the cases. Convulsions often Jacksonian some time generalized are seen nearly as often as in tumors near the entorhinal sulcus. Occasional bradycardia with a pulse rate below 60 is present in many cases. It is seldom persistent.

only recurrent and often is noted only by reviewing the hospital chart over a period of several days

Subdural hematoma during the past thirty years has come to be recognized as an important post traumatic surgical complication. Many cases are still unrecognized. The surgical profession should be more aware of this condition and realize that often it can be

recognized only by the exploratory burr hole. In any suspected case bilateral posterior parietal burr holes should be made. If no clot is found little harm will be done by this procedure which entails minimal operative shock and can easily be done under local anesthesia supplemented by intravenous anesthesia if the necessity arises for such a procedure.

HAROLD C. MORIS

REVIEWS OF NEW BOOKS

C. M. H. T. O. S. D. G. E. L. O. R. R. used
 J. M. L. Kerr, L. D. D. F. R. F. & S. F. R. C. O. G. B. I.
 Th. V. H. A. M. S. & W. H. I. N. S. C.

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THE fourth edition of *The Pathology of Infectious Disease* by Professor William Boyd follows the same plan of organization as was used in the previous edition which appeared 1931-1935.

The subject matter is taken according to the dogma of systems in the standard textbooks of special pathology. However, the book differs from others in that symptoms and physical findings are related to the pathological changes. Thus, it is neither a textbook of pathology nor a textbook of clinical medicine, rather it is a combination of the two. It is the subject of pathology as a whole, accurate and concisely and in the light of general reference to the symptoms and pathological

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W T E R C A R R L

AMERICAN COLLEGE OF SURGEONS

THE BASIC MEDICAL SCIENCES IN GRADUATE TRAINING IN SURGERY

GEORGE H. MILLER, M.D., Chicago, Ill.

PROGRESSIVELY increasing attention was being given to the subject of the basic medical sciences in graduate training in surgery prior to the outbreak of war. Since that time the pressure of war's demands on all facilities for medical education and the disruption of graduate training programs have temporarily forced it into the background. Now with the approaching prospect of peace it is again assuming a position of prominence. Its importance becomes even greater due to the difficulty of providing sufficient additional graduate training facilities to meet the needs of medical officers, some of whom are even now beginning to be released from military service.

The size of the postwar need has been dealt with in published analyses of the answers to questionnaires sent to medical offices in the military force by The Committee on Postwar Medical Service (2).

Reports have also been made dealing with the possibilities of increasing the facilities for graduate training (3). The need can be met only in part by increases in the number of residents in hospitals now qualified for graduate training. It will require in addition the development of training programs in a considerable number of hospitals which in the past have not been doing graduate training. Assistance in this expansion is expected though the utilization of some of the large private hospitals selected city and county hospitals and certain hospitals of the United States Government services. Cooperative programs are also being developed in which part of the work is obtained in the graduate training department of a medical school and part in a hospital not under medical school control.

In addition the establishment of a dental center in a hospital which has a dental graduate training program is one of the problems which confront the future and often is difficult solution. The assurance of adequate training in the basic medical sciences. The phases of training have been increasing emphasis in recent years both by the

American College of Surgeons and by the Specialty Boards. The advances in medicine and surgery have made this emphasis imperative. It is therefore the duty of the officers of a hospital to plan the establishment of a resident program to know what constitute adequate basic science training.

It is also important for the training in a specialty to have this information available. To will be able to enter more training after the war when there will be a large number of interrupted programs must be completed. Although hospital generally refer now to complete the training of their internes and residents who are now in military service the longer the war lasts the more impossible this becomes. It is certain that there will be many a young doctor who will find it necessary to complete his training program at some place other than the hospital in which he was a resident when the war brought an interruption of his training.

At the present time one hears complaints that it is difficult for the education of a resident of a hospital to find any printed statement sufficiently clear and detailed to serve as a guide for formulating plans for basic science training. The meager bold true for a training which is to be sure if the adequacy of a program when he is making choice of a hospital resident.

It has seemed desirable to undertake a discussion of this phase of training in order to try to arrive at a clearer understanding of the situation and to state an adequate program in the field of basic sciences. It is not the purpose of this discussion to arrive at a final proposal on to outline a curriculum of the basic sciences which would be taken on times in the study can be applied to the following (1) different needs for the different specialties (2) different total length of residency (3) different number of residents in the program (4) different number of residents in the program (5) different number of residents in the program.

It shall be the purpose of this paper to emphasize the different perspectives of the major subjects and to consider some of the means for attaining them.

PRELIMINARY SURVEYS

It is a matter of common knowledge that there is considerable variation in the programs of graduate training in surgery in different institutions which are doing excellent work in this field.

In order to make an effective approach to a consideration of the place of the basic sciences in the programs it seemed desirable to visit a number of representative institutions. These visits were used to some extent for the obtaining of statistical data regarding differences in the programs but still more through interviews with members of the staff who are responsible for different phases of the training they were used to gain an idea of the developmental background behind the differences. The interviews also offered opportunity for a frank discussion of the experiences in each institution as to points of special strength or weakness and the present trend of their efforts to improve the program.

The visits while concerned chiefly with the larger medical schools have not been confined entirely to the better but have sampled as well the experiences of certain smaller school and non-teaching hospitals which have been offering approved residencies. They have also been made to include a limited number of hospitals which have not been doing graduate training but are now preparing to begin it. The latter have been included in order to gain a firsthand knowledge of the special problems faced by such hospitals in undertaking this work.

Geographically the contacts have covered the country widely in order to include any significant regional variations and trends.

The following discussion has grown out of interviews with members of the staff of thirty-four medical schools and of twenty-five non-teaching hospitals.

HISTORICAL

It is worthwhile to note briefly the sequence of developments leading up to the present position of the basic sciences in graduate training in surgery.

The training of specialists in the field of surgery has shown a steadily increasing emphasis on the basic sciences over a considerable period of years. Fifty years ago the young doctor serving as an apprentice or holding an assistantship in a department of surgery was concerned chiefly with developing the best possible skill in operating. Often exaggerated prominence was given to such considerations as speed in operating and the ability to operate through extremely small incisions. Considerable attention was given to describing special suture methods and to various techniques of tying ligatures.

During this period the more energetic and progressive men holding assistantships in the better university departments of surgery were likely to seek opportunity to serve in the department of anatomy as demonstrators to the undergraduate medical classes. Some became excellent teachers of anatomy and were a source of stimulation to students by introducing examples of the practical application of the study to their clinical work. This work in anatomy has been retained by many institutions as a part of the graduate training program though not most trainees assist in the course in surgical anatomy instead of in general anatomy. The point to be emphasized is that at that time work in anatomy constituted usually the only specific emphasis on basic science during the training of the surgeon.

About the turn of the century there developed an emphasis on the value of a study of pathology by the surgeon in training. This was the result of the wider appreciation by surgeons of the fact that successful surgery is dependent not only on a knowledge of the anatomical accessibility of the lesion and on good technique but also on a full knowledge of the life history of the disease process. Whether in the realm of inflammation or of neoplasm or of other surgical conditions the surgeon wanted to think beyond the immediate anatomical lesion and understand fully its near and remote effects and sequelae.

For a time in the field of training pathology was regarded more or less as an interloper and a competitor of anatomy. One heard at times heated discussions as to which of the two should be chosen by the prospective surgeon as his field of basic science work. After a relatively few years these arguments practically disappeared. The ambitious trainees were adding pathology and retaining anatomy by giving a reduced amount of time to the dissecting room.

Some professors of anatomy resisted at first the reduction of the demonstrator's time but before long both pathology and anatomy were sharing in the basic science attention in most good programs of surgical training. A limited attention to bacteriology was sometimes included with pathology.

More recently with the extended use of surgery in the reconstructive field where physiological considerations are prominent and with the development of corrective surgery in certain abnormal physiological states physiology and biochemistry have been brought prominently into the training picture. Also new developments in the field of anesthetics requiring discriminating choice and foreknowledge of potential complications have improved handling of shock and of preoperative an-

postoperative management together with all the new advances in the control of infection have brought physiology, biochemistry, bacteriology, and pharmacology all into a position of increased interest for the surgeon. One might even add parasitology to the list out of deference to those surgeons who are dealing constantly with such conditions as hydatid cysts, amebic abscesses and elephantiasis. Thus it is evident that surgery has gone steadily into a closer relationship with practically the whole field of the basic medical sciences.

THE OBJECTIVES

In seeking an answer for the question of the hospital committee or of the trainee referred to above it is necessary to visualize as clearly as possible the objectives toward which the basic science work of a graduate training program in surgery is directed. These objectives may be variously expressed and must be permitted a certain variation of emphasis in different institutions and under varying conditions.

However the broad general objective of graduate training in these specialties is to provide for the country the highest level of surgical care by furnishing, under competent instruction and supervision, the best possible training in both surgical skill and surgical judgment.

Another objective is the development in the future specialist of a scientific interest and background which will make him capable of doing such opportunistic work as may be present in his work contributing to the advancement of medical science.

The emphasis on the basic medical sciences in the training program while directed toward this broad objective is felt to bear most heavily on that which is regarded by many as the more important and more difficult phase of training—the development of surgical judgment. For this it must be applied basic science. It is applied in many ways but especially in the scientific understanding of the fundamental interpretations of clinical phenomena in the special field. Developed in this way the basic sciences are mediated from the status of raw material and should be of real graduate caliber. They also take on new interest by evolving a threefold goal—thorough training, improved care of patients, and contribution to science.

Some unfortunate misconceptions have arisen from failure to find the applied basic science as advanced work at graduate study level. Following are the misconceptions most commonly met.

1. Review courses are needed because the resident has forgotten details of his undergraduate course.

The basic science requirements of the College and of the Specialty Boards are academic hurdles which require special basic science study to clear but are of no further concern.

3. Lectures by a preclinical teacher can cover the failure of the clinical staff to make adequate application of basic science.

4. Basic science requirement can be met by giving the resident training in the technique of the diagnostic laboratory of the hospital.

Let us consider in turn each of these misconceptions.

1. *Need for review courses.* Certainly the resident will have forgotten details of his undergraduate work and review study is necessary. This however is not done best by formal lecture courses. He should be obliged to review in order to meet the demand of the advanced work of his training program. Such demands may consist in assigned participation in well organized seminar programs and clinical conferences and should be evident also in ward rounds and clinics if these are kept to a high instructional level. The latter is illustrated by the answer of a resident he asked about attention to anatomy. He said: "We don't have any new course but The Chief gave a real quiz on anatomy as a part of his duty and after queering at each operation a few seconds to review all the time to keep up with him."

In general one may say that the demand for review should be inherent in the well organized graduate training program but for formal lecture courses of undergraduate work would not constitute a part of the student's bed leisure.

2. *Treat basic sciences as if dead.* The desire that the basic sciences be handled is not entirely correct. Certainly as requirements for qualification they assume this character. The error lies in treating them as something more than hurdles. In reality meeting these requirements should be the definite accomplishment of the preclinical work and development. The error is illustrated by the tendency of some candidates for qualification to go to the head of a preclinical department saying: "I mean to take the——— examination this spring. I want you to get me ready for taking these examinations." The student usually tries to give satisfaction in response to his request though his expression is of the permanent alienation of cases. Such a period of study is an opportunity of real value. The error occurs when the candidate takes it as a mere miming of an examination.

Likewise some hospital committees seem to have regarded the basic sciences as merely awkward requirements which must be met.

This regarding of the basic sciences as mere hurdles and the reliance on cramming for examinations should steadily diminish as more and more emphasis is placed on the application of these sciences to the daily work of the clinical specialist.

3 Use of undergraduate lectures The suggestion is sometime made by the educational committee of a hospital that they will meet the basic science requirements for residents by having them attend the undergraduate lecture courses in a nearby medical school or sometimes by arranging for professors to give special short courses in those preclinical subjects. To say that this is unsatisfactory is no reflection on either the professor or on his undergraduate course.

The difficulty is that such undergraduate lectures are not applied basic science nor are they graduate work.

If a hospital is to use university courses to supplement its training program in the applied basic sciences such courses should be given by teachers prepared for this graduate work and having a knowledge of the clinical problems sufficient to permit them really to present the application of the basic sciences.

4 Training in diagnostic laboratory The question of filling the basic science requirements by assigning the resident for a period of training in the diagnostic laboratory can be answered by recalling the main objectives of the resident's training program. It is not reasonable to use his time for training as a laboratory technician. His knowledge of the more elaborate procedures of the laboratory should be such as to emphasize the range of usefulness and also the limitations in his field. It should thus enable him to make more effective use of laboratory work in his clinical decisions.

Exceptions will of course arise as in the case of a resident who is engaging in a research problem dependent on certain clinical laboratory tests. He will need thorough understanding of those procedures and can usefully work in the clinical laboratory as an integral part of this special program.

The principle governing the relationship of a resident to the diagnostic laboratory should be a recognition of the fact that he is there primarily for training in applying laboratory findings to patients and only secondarily or in a research capacity to take part in the technical work of the laboratory.

DIFFERENCES IN APPROVED TRAINING PROGRAMS

Differences in total length of training period The length of time which has been adopted by the Department of Graduate Training of the American College of Surgeons and that required by most of the Specialty Boards for surgery and the surgical specialties as the minimum for the institutional phase of training is three years after an approved internship. In the larger teaching hospital the length of residency varies all the way from three to eight years. Approximately half of those included in this study were found to have surgical training programs of five or more years duration while the other half have programs lasting either three or four years.

At times in the past there has been some difference of opinion as to the relative merit of the shorter graduate training programs. It should not be regarded as reopening any old controversy to take the position at the present time that the new residencies to be developed in the effort to meet the postwar training load will fall for the most part in the second group and will be of three or four years duration. For this reason the following comments should be regarded as referring especially to the facilities for and possibilities of this group.

This is not overlooking the value and the necessity of training beyond the three or four year period. The ultimate aim should be accomplished effectively with a wider recognition that the years immediately following completion of a three or four year program are a continuation of training while holding a limited responsibility appointment.

Variation in content of the training programs The institutions studied showed variation not only in length of training program but also in content. Over many years the accomplishment shows however that this considerable variation of program is not inconsistent with excellent results. In reality such flexibility is desirable as permitting the best utilization of the differing facilities of institutions both in material and in staff. A certain flexibility should also be utilized in developing most effectively the special scientific aptitudes and interests of the trainee. It should be remembered however that the range of variation which may be appropriate in programs of six to eight years duration is much reduced when one deals with a three or four year program.

Time devoted to the basic sciences Confusion has sometimes occurred because of two different interpretations of this. Some have discussed it as referring only to those parts of a residency during

his residence is relatively from responsibility for patients. He devotes himself solely to one or more of the basic sciences. One regard it as including all these principles throughout the whole training. Here application of basic sciences is emphasized. The latter is a very important part of the program. In fact the permanent value of the basic sciences work is equivalent to a large extent on that degree to which the clinical staff makes constant application of the basic sciences in its discussions and work. This teaching however is incorporated so intimately with the clinical training that it fails to appear in a time record. Seminar and teaching conferences are also an important means of emphasizing certain of the applied basic sciences and these likewise do not appear in any listing of time devoted specifically to those sciences.

The above distinction must be taken into account in the formulation of a graduate training program and adequate provision must be made for both phases of emphasis on the basic sciences.

In some of the hospitals which have residencies of six or more years it is customary to have assignments totaling as much as eighteen months or two years devoted primarily to the basic sciences and research. Obviously such a program is not applicable to hospitals which devote only three or four years to the whole residency. In the latter group of hospitals the time devoted entirely to the basic sciences must be considerably shorter. Usually it varies between six and twelve months. This shorter amount of time devoted corresponds in the range of flexibility in that part of the program.

What basic sciences should be included? An introduction to a discussion of the basic sciences to be included the following concepts are quoted from the published requirements of the different boards of surgery and the general specialties of the American College of Surgeons:

Surgery. The period of study should be sufficient to enable the student to acquire a thorough knowledge of the principles of surgery, anatomy, physiology, pathology, bacteriology, and the principles of diagnosis and treatment.

Obstetrics and Gynecology. The student should acquire a thorough knowledge of the principles of obstetrics and gynecology, including the principles of diagnosis and treatment.

Internal Medicine. The student should acquire a thorough knowledge of the principles of internal medicine, including the principles of diagnosis and treatment.

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Obstetrics and Gynecology. The student should acquire a thorough knowledge of the principles of obstetrics and gynecology, including the principles of diagnosis and treatment.

Physiology and Pathology. The student should acquire a thorough knowledge of the principles of physiology and pathology, including the principles of diagnosis and treatment.

Pharmacology. The student should acquire a thorough knowledge of the principles of pharmacology, including the principles of diagnosis and treatment.

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receiving a parate time allotment must not be regarded as la king in importance

The most common special assignments of time for the basic sciences are to pathology and anatomy

Pathology Since many of the surgeon's decisions depend closely on his personal knowledge of pathology this subject becomes the one most urgently requiring an individual assignment of the resident's time. There is practically unanimous agreement on this. The hospitals with long training programs in many cases allot a whole year to pathology while those with shorter residencies commonly reserve six months primarily for this work.

In addition to this period of concentrated attention to pathology it is of course essential that the resident throughout his whole training should continue to study the pathological material from his service. In a surgical service which has its own department of surgical pathology this is easy. In others the necessary daily or frequent contacts with the department of pathology must be maintained. A few surgeons have voiced the belief that the latter type of study of pathology can be made sufficiently thorough alone to serve for the resident's training in this subject. Most however think that this type of divided responsibility can not produce as good a result as when combined with a period of full time service in the department of pathology. Another advantage in the assignment to pathology lies in the opportunity during this time of carrying on or of collaborating in a research problem in this field. The experience in exhaustive reading in the field of his research problem and the need for discriminating evaluation of the work of different contributors to its literature are an invaluable element of this part of his training.

Anatomy Often a special assignment of time is made also for the study of anatomy. This is true in about half of the programs surveyed. Two surgeons placed anatomy as more important even than pathology in the study program. However this is more than offset by the opinions of many professors of surgery who think the time can be better utilized if careful attention is given to pointing out anatomical considerations added to quizing prior to and during operations and in the autopsy room thus allowing studies on the cadaver to be reduced to a relatively small number of special regional dissections.

While a separate allotment of time for work in a department of anatomy is desirable and is possible in the longer training programs it would seem that the necessary emphasis on this subject

can be otherwise provided in a well organized training program. In this case however it must be definitely included as a teaching responsibility of the surgical department.

Bacteriology physiology and pharmacology Applied bacteriology will usually be included to some extent during the period devoted to pathology. In general however all of the above group of subjects are applied so continuously in the daily work of the resident and are such an essential part of the study and treatment of his patients that the clinical work of the hospital becomes the place where the advanced study of these subjects must be centered. Every ward round and conference must stress one or several of all of the above according to the variety of the cases presented. They should also be given special and detailed application in seminars planned for that particular purpose.

The use of specialists from preclinical departments and from other clinical departments who are qualified for this teaching is a necessary part of the program but they should be regarded as consulting specialists and contributors and not used as a means of relieving the clinical staff of their continuous responsibility. The resident's research work also whether clinical or preclinical in origin will require advanced study in one or more of the basic sciences.

The important broad consideration here is that the application of these sciences to the study of disease in patients should be real graduate work for which the clinical departments must carry a large share of responsibility.

Use of teaching assignments in preclinical departments In the longer residencies an assignment to assist in a preclinical department can sometimes be used to advantage since the liberal time available allows the resident to engage in research and advanced study as well as to assist in teaching. In the shorter residencies the brief time available for such an assignment is likely to be entirely occupied by a heavy routine teaching program. This creates a danger that the resident may become only a borrowed teaching assistant instead of a member of the graduate training group of that department. Preclinical teaching assignments should be used only when the training value for the resident obviously compensates for the time allotted to the department.

Research The value of research as a means of stimulating study in the applied basic sciences should be utilized in the graduate training program. Only the longer programs can allot a large segment of time for example to the bacteriology laboratory for a study of infections or to some

other laboratory for experimental work in that field. Nevertheless it is possible and necessary even in the shorter programs to stimulate an inquiring attitude of mind and to encourage and guide the resident in investigative work on some problem of particular interest to him.

Co-operative programs. Some hospitals recognizing their eagerness for training in the basic sciences have corrected the defect by appointing to the staff men specially qualified for this work.

Other hospitals which face a similar difficulty but are unable to apply the same solution should seek to develop a co-operative program with the hospital of a convenient medical school or with a graduate school of medicine which gives a fully approved graduate training program. The following illustrate different forms of co-operative effort already being used.

1. A co-operative program is arranged with the hospital of a medical school under which part of the residents is spent in each of the two hospitals. Three-year programs divided on both 2:1 and 1:1 ratios are being employed. Two years in each hospital is a proposed improvement.

2. When a medical school is near at hand a program may be planned by which the residents can have access to certain of the applied basic science facilities provided for the surgical residents of the university hospital.

3. Arrangement may be made for the resident to spend one year in the combined applied basic science and clinical program of a graduate school of medicine which offers a fully approved graduate training program.

4. Arrangement may be made for selected members of the staff to become temporarily ad-

juncts to the teaching staff of a university hospital to gain a broad scientific background and a better familiarity with graduate training methods.

5. A hospital may secure the assistance of guest teachers. This refers not to the usual series of visiting lecturers but as one hospital employs it a ten-day full-time visit during which the guest takes part in ward rounds, discussions with the staff as well as in the conferences and seminars for residents. Additional forms of co-operative effort will doubtlessly be devised as medical schools and hospitals continue to work a plan to either for the best utilization of their combined resources for graduate training.

The foregoing discussion has dealt with the basic science requirements in a broad way and in the light of the immediate postwar training needs. It has not dealt with strictly one-department questions such as the need of ophthalmology for special courses in physics of optics and physiology of optics nor of otolaryngology for similar need with reference to sound. Likewise the big question of need for a greater responsibility on the part of medical schools for graduate education in the clinical field has been omitted.

It is hoped that the discussion may be of assistance to certain hospital staff groups who desire to undertake graduate training to evaluate their resources and to take the necessary steps to organize a strong training program.

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July, 1945

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CARR L D S d C P R t g P th
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SURGERY OF THE ABDOMEN

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t h a l a m N t o r u m

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SIMP F E C l ns d n g G n I A s
th
C LE I Th U f C A esthes A R
f oo C se

Surg I I trum ts and Appar ts
S I W Th Effect f T perat th
Digest f C l l g S t es d Su g l G t
(Catgut) by L ymes d by th S beat
T f th F g

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R tg n logy
Lt crr K P g t D ea e f th \ ppl th
Spe l R f t It C urs d T tm t
L m A R M d C orr CS I e m m d
astu m th \ born
Z mo J a d S cs M M F hu ococ Cy t
f th H t R pot f C se
B u r S S d S s u M L Th ra c
M fest tu f S dos
V m A Solitary d M l pl C r f
th Uppe Alum tary Tra t
F m \ DAE J O Stra gul t g Obstru t f
th Small B w l th Spec l R f t
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M ve M Sp ta Ch l y tod od I
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NU R I

CRANIOPLASTY

Collective Review

JACK I WOOLF MD and A EARL WALKER MD FACS Ch ag Ill n

INTRODUCTION

THE interest of the ancient physicians in trepanation suggests that cranioplasty was not an unknown field (5). In the old world a number of writers discussed the repair of cranial injuries. Fallopius (2) states that if the bone is uncontaminated and healthy it may be replaced provided the dura mater is intact if the brain is exposed the loose bone fragments should be discarded and a gold plate inserted. However the procedure seems to have fallen into disrepute for both Franco (4) and Pare (11 p 67) speak disparagingly of the operation. They infer that in many cases cranioplasty was carried out by quacks who pretending to put the precious metal into the cranial defects surreptitiously dropped it into their own pockets. Religious tenets of the time also mitigated against the procedure. In 1670 a skull defect in a Russian was repaired with a piece of bone taken from a dog. However the ecclesiastic nobility decreed that the bone of a dog was not befitting the head of a Christian gentleman so that under threat of excommunication the bone was removed (6 p 7).

In many of the primitive races trephining was practiced by the natives usually to let out the devils that plagued the patient. After the bone was exposed by a T shaped scalp incision the cranium was scraped away until the dura was exposed. To cover the defect a piece of coconut shell was inserted and covered by the scalp (13 p 9). Although this procedure had a 50 per cent mortality in some South Sea Islands most of the males had been subjected to it at some time.

The modern era of cranioplasty was introduced by Merrem (7) who in 1820 experimented on

dogs. In 1821 Philip von Walther (13) carried out the procedure in man. With the advent of antiseptic techniques and more devastating weapons of warfare the conflicts of the last hundred years have given a great impetus to cranioplastic surgery.

INDICATIONS FOR CRANIOPLASTY

As Grant and Norcross (59 p 404) state. There seems to be a happy accord among most of the authors as to the indications for cranioplasty. The more common reasons for closing a cranial defect are pain or tenderness at the margin of the opening the syndrome of the trephined convulsive states disfigurements military reasons and certain psychogenic manifestations such as anxiety or a feeling of insecurity from fear of injury to the brain beneath the defect. One or more of these indications may be present in any individual case.

Pain o tender ess ab ut the skull defect. Not infrequently the scalp becomes extremely tender about the margin of a cranial defect. This hyperesthesia may be associated with either a protrusion or a depression of the scalp over the cranial hiatus. It is generally assumed that the pain is the result of chronic traction of the scar tissues upon the nerve fibers or endings in the scalp. At times the tenderness is so extreme that any manipulation of the scalp is intolerable. The following case is presented as an example of this complaint.

C se (G F U t N 76989) Af ty ix y -ol
hou wif as f ed t the U rs ty f Ch cag Chni
by R E K rsch Sh compla d fh vi g had faint g
pell f ix ye rs Sh was d pp ben
w m whose gen l phys cal xam ti quit
m l Ca f l i t des f th l f kd eal d om
pl t l ft pe h sn ym q d ta ps B f th

From the Department of Neurological Surgery, University of Chicago, Chicago, Ill.



Fig. (C se) L ft P t t tg gr m f th k ll h g th cr h l
h m t bef e pl ty d ght th cm l t f th head ft p u

pu dsc w l t d b t d 3 d pt rs O
f rm d d m g m m d f m th b f th
right m d d l f m m m d m d t es-
sary t ruf th b fl p d t l th lp
Th p t th d t l t At th t
f th k ll d fect m ked b l h t m d
Th p t t c u ed t m pl f p tal h d h
dizz es erv es d h b Sh dvi d
t h p ty b t f d Th p t m g
f th d f t b e m q t ly t d t t mb g
th h w painf l B se f g d f f lt h
fin lly se t d t p f th k ll d fect
O J ry g 944 h turn d t th h p tal Th
t f th h d Th t mp l a g l th d f t
t d th t h l ta t f ll p l t f th
k ll E pt f th l cal ph l s d s d l ft
ppe h m ym q d ts p b phys l nd
l g l f d g m l Al mb p t
eal d p f g mm f b p l f d Aft
m l f s f f d th d f t b m ll th ed
nd t f t ry pl t m ld as bta d
O J ry 5 944 th p k l p t m d
d d th b m g p d by g d t p
p g th p n teum A p f m d ryl pl t
t d w th t d f lty d f d pl th l w
tur Th co les q t t f l O th
fifth po t p t d y 6 f ou f d
p ted f m be th th lp Th t f th h d
ppe ed m l Th f g p t d m
t th u t t th t f th pl ty Th p
t t t ap m t m h mp d
Wh h w t m th ft th n pl ty
h f lt ry w ll and h d m pl t (Fg)

Syndrom of the t p l ed The most common complaints of patient with a defect of the skull are headache and dizziness aggravated by bending or stooping. The are particularly pro-

nounced in the first few weeks after the occurrence of an opening in the skull later gradually decreasing in severity. They are probably the result of vascular alterations associated with the change of position of the body. Many patients recover completely from these symptoms but others continue to complain and may even develop more symptoms such as easy fatigability and lack of concentration. While unquestionably this syndrome is partly psychogenic it usually is cleared up or markedly alleviated by cranioplasty (394). Terrier (228) reported that 37 of 63 cases treated by repair of the defect were markedly improved.

Conclusions The factor producing a skull defect frequently causes damage to the underlying brain as the result of which epileptic seizures may occur (383). In some instances such as in the case of a brain tumor the attacks may antedate the occurrence of the opening in the calvarium. The precise pathogenesis of the convulsive seizure is not clear. In some cases the cerebral scar tissue secondary to laceration or hemorrhage may be a factor in the instances of common cerebral aneurysms may play a role. Pneumoencephalography may show localized intracranial dilatation at the site of the defect which indicates a bony cranial defect. Electroencephalographic studies of the case may indicate an area of abnormal electrical activity. Even in the absence of abnormal pneumoencephalographic or electroencephalographic findings an operative approach may alleviate the convulsive state (59). In these cases



F s (C) Left Ph t g aph h
ly d ght th m t h ft
take fr m th t t bl f th sk ll



th calpd fr m typr p tu
p f th c l d f t by g ft

associated with localized ventricular dilatation the dura mater is usually matted to the underlying brain so that it is advisable to resect the adherent dura and the scarred brain to the ventricle and then repair the dural defect with penosteum or fascia lata (62 239 382 384). Repeated subdural injections of air have been recently advocated to further decrease the likelihood of corticomeningeal adhesions (369). Following cranioplasty for epileptic states anticonvulsant medication should be administered postoperatively for at least several years. If the attacks do not recur the medication may be decreased gradually and eventually eliminated.

C z (M B Unit mb SoSo) Af t y
ldh y d l ped e f t l h d h ft umung
J 939 O klt bscs wh h b d
d l ped o th l f t y w m s d d d ed Th
b d hes u d th in re g ty O J b 4
939 h h d m j rui Abo t S p mb 6
944 h compl ed f ei gh d h thoca i
m u d p l p f d tant bject d bl d
H w f r r d t th U r s ty f Ch g Cln's by
R S V f Rock d lll S p t mbe 939
H phys l d l cal t n l
cc t i m ked b lat l pap l d m niso (th
l f t p l be g 4 m m th right 3 m m) l ght l f t hype
f l n d t um po u B b l g the l f t
d Vt th tuz g th pat t w th th Sep
t mbe 939 m l lnci w m d j t beha d th
ha l th ght f tal g Th bo as per
f rated d th pe g l r g d t th f l
d llar Aft se b g f th bd al pace th d f m
ga brai p t eedl m s e t d bscs
enco t red t depth f 4 cm Abo t 4 f yell w
pus f wed t ft huch f th t r a s t
jected d th d as closed th t d r a g On
Septembe 7 939 th c i w reope d d th

bsc ty d p ck d d d ed At oubl
sora b l f u n t l l d by r p t d l mb
P n q red m p t t O i be 9 939 d
N mb 4 939 w th p t l q t c i m y th
l t t Th w u d th h l d p d ly d th
p t t d scha g d N h d 936
I O t h 94 th p t th d g h d l
d g p pt f ph h h tal
g t b t k th t m d v H t k th m d
gula ly d c t ed t h 3 r 4 m j iur
y
O M h o 944 h w d v e d t h th l
d f t p ed C m p l t physical d n l gical
m u t d b m lites Th c w q t
dh t t th d feet d d p ed h l w th m l
t f th f r tal g On M h o 944 d
th th m p l y w p f r m d An c i
s w m d j t beha d th h a l n t d th sca
a dw d l t lly d m d lly Th b l p t
f th sc mpo ed f g n h d s c l d m
whch es t d d w to th t n l P n t m
tak f om th d j t f tal bo was used t p
th d l d f t Aft fesh ang f th m g f th
bo y d f t d th f r m t f m l l h l f f
t b l graft f th t tahl d p o t u m f m n
d j t w h u s e l l e d d l d t th d f t S u t e s
pa sed thro gh th m g u n f th graft and d j a c t
bo t f i x t t p l t p l Th k i m g i w
app m ted th d f i lty Th p t t h a d n e n t
f l l e s c d w d scha g d th t th p o t
pe t d y A lth gh t too ea ly t j dg the th r a
pe t e s f h has bee f e e f t t a l f m n m th
(Fgs d 3)

Cosmetically indicated Cranioplasty is indicated for cosmetic reasons predominantly if the cranial defect is located in the frontal region. Usually such cases are complicated by unsightly scars. If the frontal sinuses have been involved the disfigurement may be quite severe. The use of alloplastic substances is particularly desirable for the

repair of such large defects because an almost perfect restoration of the contour of the forehead and supraorbital ridges may be accomplished.

Military reasons Because army regulations state that a soldier cannot be returned to active duty if he has a cranial defect larger than 2 cm in diameter cranioplasty is necessary in military practice in order that the patient may be eligible for duty.

Feeling of insecurity Although the actual danger of traumatizing the cerebrum through a cranial defect is very minimal patients frequently complain that they are constantly worried lest they hurt their brains and in some cases such anxiety amounts to an incapacitating psychoneurosis. Cranioplasty may lead to a regression or marked amelioration of the psychoneurotic disturbances.

Psychogenic disturbances induced by a cranial defect Patients of a psychoneurotic personality will frequently have a marked exacerbation of their psychogenic difficulties if they suffer a head injury which results in a cranial defect. Psychosomatic manifestations may develop. In such individuals cranioplasty may offer relief but the cases should be carefully selected after psychiatric consultation.

CONTRAINDICATIONS

Since cranioplasty implies an attempt to restore an individual to a normal state its performance should be delayed until the primary condition producing the abnormality is no longer active. Otherwise the operation would be of very temporary benefit. In practice there are a number of factors which are relative or absolute contraindications to the procedure.

Infection It has been considered axiomatic that cranioplasty should be carried out only when the wound has been completely healed and free of infection for many months. In some cases even when an interval from six to twelve months has elapsed from the time of healing a cranioplasty has resulted in a reinfection of the tissues because of the failure of germs still present in the scalp. Small encapsulated abscesses usually have become sterile by this time but the capsule and surrounding scar tissue may still contain viable pathogenic bacteria. In the present world war this period of waiting for infection to clear up has been reduced to a few weeks by the routine use of the sulfonamides and penicillin. Some operators have successfully placed alloplastic grafts in infected wounds trusting that the mother pty to take care of the infection. However, such early cranioplasty appears to be a

considerable risk of failure due to infection. The consensus of opinion is that the wound should be healed for a few weeks before the cranial defect is repaired even when sulfonamides and penicillin are used.

Abnormalities of the cerebrospinal fluid Alterations in the cellular constituents, protein or pressure of the spinal fluid usually indicate the presence of an active pathological condition in the nervous system which contraindicates cranioplasty. A pleocytosis of the spinal fluid without leukocytosis and an increase in protein is usually an indication that there is still active inflammatory reaction in the nervous system the most likely cause of which is an abscess. Persistent increased spinal fluid pressure suggests the presence of a space occupying lesion or pathological alterations in the circulation of the cerebrospinal fluid. Cranioplasty removing the dural pressure would precipitate marked intracranial hypertension on which might elevate the graft and the defect or flooding this means relieving the tension gives rise to headache vomiting and papilledema. For this reason papilledema is obviously a contraindication to cranioplasty (378). Even if the spinal fluid is normal it seems advisable in all cases of penetrating wounds of the brain to eliminate the possibility of a latent brain abscess by pneumoencephalography (373). These contraindications must be valuable at a later time if the patient emerges without the symptom.

Foreign bodies within the brain The presence of metallic particles within the head has been said to be a contraindication to repair of skull defects (385). However, the fact that many such objects may be present in the head for years without producing a focus toward infection would tend to negate this view. Bullets and metal missiles per se do not appear to increase the incidence of abscesses or epileptic manifestations. On the other hand fragments of bone definitely suggest the chances of infection and brain abscess (373). If these fragments are not readily accessible and cannot be removed at the time of cranioplasty pneumoencephalography would seem to be indicated to rule out the possibility of coexistent abscess.

Severe disability There appears no necessity to repair a small cranial defect in an individual suffering from severe disability such as hemiplegia. The advisability of cranioplasty in less severe neurological disability must be determined by consideration of the individual case. Unless the cranial defect is really contributory to the individual's incapacity one of the positive indications for cranioplasty is present there seems no reason to carry out the procedure.

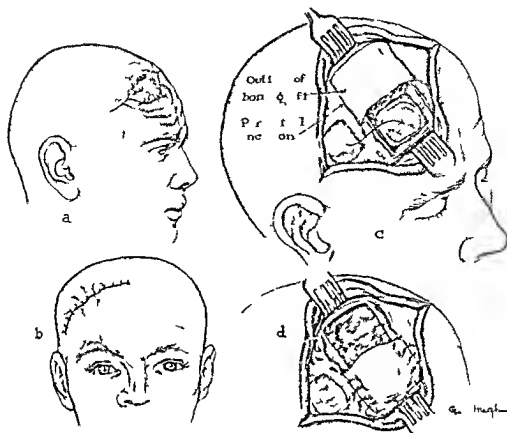


Fig 3 Sk th f h gth b f ()
th po tpe tu lt (b) th p fth d l d f t
thpe t m dpep tu fth g fth mth t

tabl fth k ll () dth gr fth ld pl byp n t l
i (d)

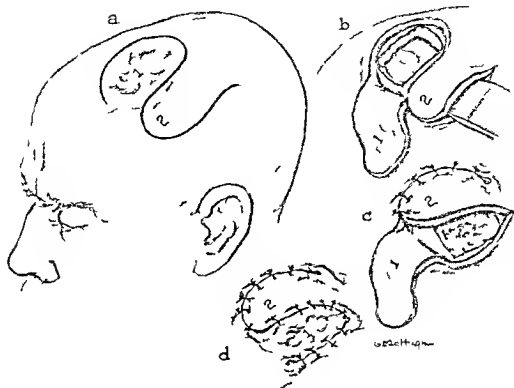
Epil psy The French ministry of health in the first world war (385) in a circular on cranioplasty stated that epileptic attacks of any kind contraindicated repair of a skull defect. This view is not generally held and as a matter of fact many surgeons believe that epileptic attacks may constitute an indication for cranioplasty. This is founded on the grounds that in some cases convulsive seizures have been decreased or abolished by repair of a skull defect. Unfortunately not much statistical information is available. Cranioplasty and Norcross (59) report that the conditions in 18 of 27 cases were improved or the patient was free of attacks after cranioplasty; the latter the cerebral excision benefited 10 of 18 patients.

THE TIME FOR CRANIOPLASTY

Some comment has already been made upon the length of time that should be allowed to elapse

following a head wound before a cranial defect is repaired. In cases in which the wound has been infected it would seem advisable to wait at least a month after complete healing before cranioplasty is done. In the absence of infection the defect may be repaired as soon as the wound has healed. Not a few operators have suggested primary repair of a skull defect with autogenous (15) heterogeneous (256) and alloplastic grafts (369). Unquestionably immediate grafting may be well tolerated in many cases but it seems probable that in a certain percentage of such cases the graft would have to be removed because of the development of infection about retained fragments. Since these cases would require a second operation anyway this may not be a serious objection to the procedure.

In military practice early cranioplasty may permit men who have had penetrating wounds of



Γ 4 Ill t t t h th m M ll K g t f f p () th unt h g f th f p d (d) th
p oc d () th h f ca (b) th f p (-th 6 l pp Th m tu lt t ry a u f t r y
sc lp f d f m th d f t d -th d m t p t

the brain to return to duty within a few weeks of the injury. Convulsive seizures will occur in from 30 to 40 per cent of this group in the majority within 3 months of the time of injury. It is important to prevent a man on duty from having an epileptic attack since it might not only endanger his life but those of his comrades. Delayed repair of the defect would allow him time to elapse to minimize the likelihood of an attack after the patient returned to duty. For this reason and since so much of present military practice is mechanized it may be well to delay cranial plasticity in all penetrating wounds of the head. Perhaps electroencephalography studies of head injuries may indicate the potential epileptic

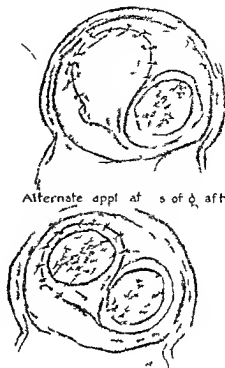
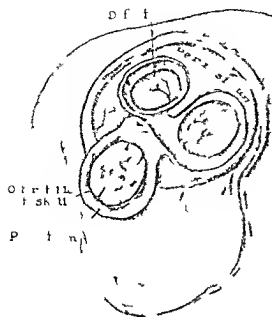
specimens (homogenous grafts) from other species (heterogeneous) or from outside of the animal kingdom (metal or plastic graft). The earliest grafts were bones of the lower animal or the rare metals that could be easily hammered into shape. As experience accumulated and surgical technique improved, the choice of the graft became more varied.

AUTOGENOUS GRAFTS

The ideal repair of a cranial defect is the regeneration of the bony calvaria. Rarely this occurs in children who have had a portion of the skull removed from the myelomeningocele. Although attempts have been made to stimulate osteogenesis in off-tissue or a bony defect (37, 39) satisfactory clinical results have not yet been obtained. Autogenous bone grafting may serve as a substitute for the regeneration of new bone. In the final analysis, however, the success of this

TYPES OF CRANIOPLASTY

The material used for the repair of cranial defects may be derived from the same individual (autogenous graft) from another of the same



F Th D t H k p ed h g
th gl lp fl p dh g d graft (l ft) h h i d

pla with th pe t m th t l t l
rf (rht)

technique depends upon the fate of the transplanted bone. If the graft is absorbed and replaced by fibrous tissue it cannot fulfill its purpose adequately but if it remains viable or is replaced by living bone it is pre-eminently satisfactory for the repair of the cranial defect. Unfortunately in spite of considerable experimentation (10, 19, 25, 26, 28, 30, 41, 70, 195, 259, 737, 380, 386, 387, 388, 391, 396) a complete understanding of the fate of a cranial bone graft has not yet been determined. Only by means of biopsies of human cranial grafts can the question be settled because the findings in animals probably are not applicable to man. From the clinical standpoint however unsatisfactory results in autogenous osseous cranioplasty are of common occurrence. As a result of absorption of the graft Grant and Norcross (59) report only 3 unsatisfactory cases among a series of 58 cases. King and Ande on (3) report only 1 case of absorption of the bone graft after cranioplasty in a series of 33 cases.

It was stated early by Ollier (10) that regeneration of bone was dependent upon the periosteum. On the other hand Mace en (86, 300) thought

that the periosteum was only a limiting membrane and that new bone was derived from bone itself. Phemister (397) demonstrated that both views were correct as he concludes: "Osteogenesis in bone repair occurs from the inner layer of the periosteum from endosteum and to a much less extent from bone cells and fibrous contents of the Haversian canals (397 p. 33)." However that which happens to free autogenous bone grafts implanted in the skull of man is not yet agreed upon. Some investigators maintain that the graft is slowly replaced by creeping substitution of living bone from the adjacent calvaria; others firmly state that it becomes calcified slowly and is replaced by fibrous tissue (201). Probably both views are correct; the end result in any case depends upon the age of the patient, the condition of the graft and the surrounding tissues and the state of sterility of the wound.

11 pt is post op: the Muller-Koenig method. On the basis of the experimental studies of Wolff (14) Mueller (95) and Koenig (74) at about the same time in 1890 devised a method of repairing skull defects by transplanting a flap of skin the

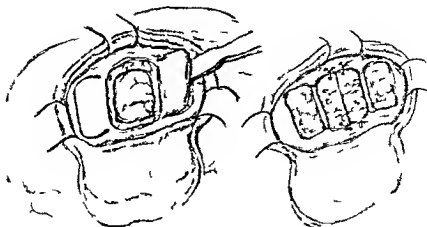


Fig 6 The double flap method for the treatment of the skull defect. The left drawing shows the defect and the right drawing shows the result after the bone grafts have been placed.

underlying periosteum and the outer table of the skull. Two adjacent skin flaps hinged at opposite ends were outlined, one enclosing the scalp over the defect and the other enclosing the donor scalp.

The scalp was stripped from the margins and base of the defect, the edges of the bone were freed, and then the two flaps were transposed so that the donor dermatoperiosteal flap covered the cranial defect while the flap formerly over the defect covered the donor area (Fig 4). If the donor area could not be completely covered by this method, it was allowed to granulate or Thiersch grafts were applied. Slight modifications of this technique (81-82, 96) added small refinements without deviating from the basic principle. This rather bloody procedure did not permit as satisfactory cosmetic results as might be desired because of the twisting of the pedicle, so that it was soon modified by turning a single skin flap and using a periosteal-osteal graft.

Periosteal osteal graft. Apparently first used by Derrant (54), this method of cranial plasty has perhaps been more universally used in one form or another than any other technique (1-5, 16, 7, 8, 10, 1, 4, 3, 32, 33, 34, 35, 36, 37, 38, 39, 40, 4, 43, 44, 45, 47, 48, 49, 50, 5, 52, 53, 55, 56, 57, 58, 59, 6, 61, 63, 64, 67, 68, 71, 73, 76, 77, 78, 79, 80, 83, 84, 89, 92, 93, 94, 97, 98, 99, 100, 10, 2, 103, 104, 105, 1, 6, 107, 8, 109, 110, 11, 1, 2, 13, 4, 1, 5, 1, 6, 117, 1, 8, 9, 1, 21, 123, 1, 4, 1, 6, 1, 7, 128, 29, 13, 147, 52, 4, 327, 376, 398, 399, 400, 401). The

original method consisted of reflecting a skin flap sufficiently large to expose the defect and an adjacent donor area. The periosteum was freed from the margin of the defect, the edges of which were freshened by rasping. The periosteum was then cut about the proposed graft on all sides but that adjoining the defect. The outer table was elevated by a chisel. The osteoperiosteal graft was then turned over the defect, the attached periosteum being used as a hinge. The periosteum or dural plate was placed against the dura mater and the graft held by periosteal sutures (Fig 5).

Several modifications of this technique have been introduced. Periosteal-osteal flaps may be cut on each side of the defect and then turned over to fill it (Fig 6) (29, 88, 90, 100). Instead of hinging the graft (46, 74), some operators preferred to slide the graft into place. Hofmann (66) left the periosteum attached by a single suture enough to permit the bone to be swung into the defect. Others used the bone with or without the periosteum as a free graft (3). Bone chips alone as Macewen (85, 87) and Kenney (75) suggested have given satisfactory results in the repair of small defects. While many advantages were claimed for these modifications, time has demonstrated that there is little cause to choose between them. If relatively large grafts are being used, it is advantageous to have the periosteum attached since the outer table will crack and may fragment if it is not firmly adherent to the pericranium. The lateral tables in molding the flap to the desired

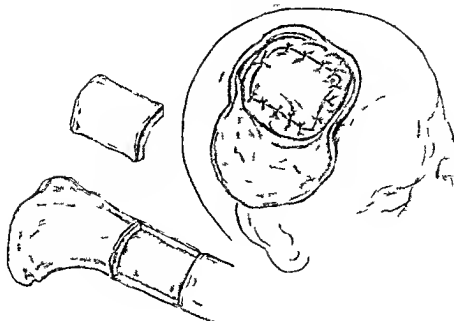


Fig 7 Sk th sh g th t p n t l g r f t m th t b (l t) d f t r t

shape and may be sutured to the periosteum about the margins of the defect.

Tibia grafts. Many sources of extracranial bone have been used to repair cranial defects. Which one is chosen seems to depend largely upon the personal experience of the operator. Seydel (156) in 1889 used a tibial osteoperiosteal graft successfully. Naturally dubious of the take of the graft he observed it for five days before he sutured the scalp. Although a tibial graft is applicable only to a relatively small cranial defect unless multiple grafts are used the technique has been quite popular (Fig 7) (65 73 128 132 134 135 136 137 138 139 140 141 142 143 144 145 146 149 151 152 153 154 155 157 158 159 160 161 167 232). If an extensive graft is taken from the tibia particular care if the crest is removed a spontaneous fracture may result in overactive patients. Berndt (131) Axhausen (22) Bufah (133) and Lever (148) suggested leaving a fat pad on the periosteum to place against the dura mater. The necessity of two operative fields is a decided disadvantage as it increases the risks of infection and postoperative complications. Morrison (150) states that the patients all complained of their leg more than their head (150 p 456).

Rib grafts. The rib being curved is readily adaptable to the contour of the skull and makes

a satisfactory graft to repair a small defect. Kappis (168) in 1915 used the full thickness of the rib with the attached periosteum and fat to cover a dural and skull defect. A year later Weber (174) reported on its use emphasizing the adaptability of the twelfth rib to cranioplasty. This technique has found many proponents (59 162 167 172 173). Brown (163 164) in 1917 suggested splitting the rib and leaving the inner lamina as protection for the thoracic contents. Others (165 166 169 170 171) have split the rib to gain more grafting material without seriously decreasing its strength (Fig 8). The following case will illustrate the use of a rib graft.

CASE 3 (R B U T N 36989) At ty th y
Id h t m l w d m t t t th U v e r s i t y f C h i c a g
Cl S p t m b e 6 94 O y p l y h
h d s t e d m p o d f r a t f t h n g h t f m m
b o d m m t e d f t f t h n g h t f m m
m t c y l c c d t A t h e s u l t h f t t h p l
t u g d f e c t t h g h t f t a l g m g s b y
4 c m F c o m t e c r a s o s h d e s e d p l a t u p
f t h d f m t y T h e c t a g u l h p e f t h d f t
a s d b l y t e d f r i b t r a n s p l a t O S e p t m b e r
8 94 e r a p l a t y a s p e r f u r n e d A s w
m d t c i t h f m s c a d c a r n e d l g t h h
h n t h g h t s i d T h s c a l p d p o
t p p e d t l y t r o s e t h t d f e c t A t t h
m r g i f t h d f e c t t h p e n o s t m w t d t r n p p e d
f r o m t h b o T h t h k e d d d b r e t d u r l y g
t h b r a t u s a s e s e c t e d t o l e a t h k e d r a c h d

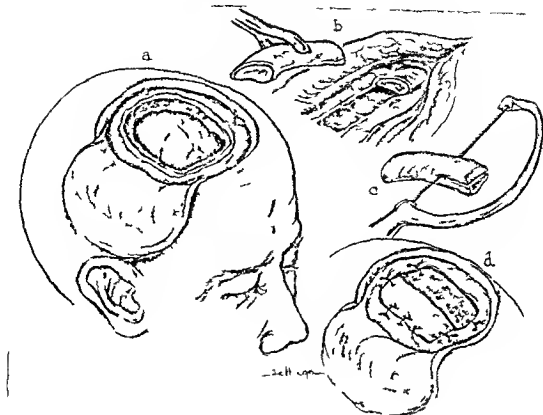


Fig 8 Ill t t h gth t h q f p p g d ep gth d fect with th piece f nb (d)
th sk ll () bt a p f b (b) pltt g t ()

t th t I th m tum d p f
m d l gth l ft th nb d bt m d
segr t f th b th was th cut t sit th d f ct
Al g th p rph ry f th g ft d th m g f th
d fect p d m d d h h th g h b h k
t w ted f fix th graft pl Th calp
as l d th tw l y r f l k t th t d m g
(Fig 9)

Th w d h led by p m ry t t with t th
accumulat of fluid b th th sc lp At th tum f
th p t t dusch g th f th po t p t d y
th cosm ti es l w y gr t f y g

Ilium grafts. The ilium was apparently not used as a source of bone for cranioplasty until Mauculae (177) in 1714 repaired a cranial defect with a graft from the costal ilium. Petherick (180) used the outer table and Petherick (183) the internal table of the ala of the ilium. Naffz (179) Mney (178) and others (69, 75, 76, 18) have also used this bone as a source of grafts for the repair of skull defect. It has been found finite advantages over the use of the tibia or rib in that irregular concavo-convex grafts may be obtained

which approximate the contour of the skull (Fig 10). The procedure has the disadvantage that two operations are necessary: the cranial defect is delayed because of the weakness of the thigh muscles and fracture of the pelvis may result if too strenuous activity is engaged in early. One of Monys (78) patients sustained a fractured pelvis during convalescence after the operation.

Scapulae grafts. The scapula as a source of bone for cranioplasty has the advantage that it is covered by perosteum on both sides and that relatively large pieces of bone may be obtained. Ryle (90) introduced its use in 1911 and since that time it has been used by a number of operators for cranioplasty (69, 183, 84, 185, 186, 19).

Sternum grafts. Muelle (187, 188) reported 7 cases of cranial defect repaired by grafts from the sternum. In 1915 Westermann (191) mentioned the sternum as a source of bone for cranioplasty. Mnell (188) in 1909 reported 7 cases in which

sternal bone had been used for cranioplasty. It does not appear to have any advantage over bone from other sources and has not been frequently used (189).

Preserved bone The use of autogenous bone stored in a preservative and subsequently reimplanted in the skull dates from Macewen (85-86-87) who reported that bone kept in a corrosive sublimate solution might be successfully replaced in the skull (cf also Gerstein 193). In 1916 Westermann (191) suggested boiling the bone before replacing it. Kreider (194) used the novel method of storing the cranial bone in the abdominal wall until it was replaced at a secondary operation. Many surgeons have removed bone flaps, stored them in alcohol or formalin and boiled and replaced them with satisfactory results but not a few have had to remove the bone subsequently because of a draining sinus.

Cartilage The use of cartilage to repair cranial defects was popularized by the work of Moresstin (216) in 915. Because cartilage is easily molded and relatively resistant to infection it was enthusiastically received (78-196-197-198-199-201-202-203-204-205-206-207-208-211-212-213-215-217-218-219-220-221-222-224-225-226-227-229-230-33-234-235-236). Among 66 cases in which it was used Lagui re (210) reported only 1 failure. Chutro (200) reported 54 cases with primary healing in all instances. Julliard (209) examined 39 cases in which cartilage had been used for cranioplasty, ten or more years previously. He found the defect firmly filled in and the contour normal in 35 cases, although in 15 cases small areas of cartilage appeared to have been absorbed. This is not surprising in view of the fate of the graft described by Leriche and Policar l (214) who studied 2 cases, thirty-six and three hundred and two days after cartilaginous cranioplasty. The hyaline cartilage had undergone degeneration and was not reabsorbed and invaded by connective tissue. The fibrocartilage appeared to be living but it was being invaded by connective tissue from the host. Cartilage is useful if at all at the present time for cranioplasty because of its flexibility (9) its tendency to warp (223) and the relatively small amount of it available. There is no reason to believe that it has any advantage over bone.

Fascia The use of temporal muscle and fascia to cover defects of the skull was suggested by Beck (237) in 1906. Various plastic repairs with pericranium or scalp have been proposed (238-240-374-377) but these methods have limited application to small defects of the bone which usually require no repair.



Fig 9. (C s 3) P t r o t n t g g r m f the skull how g th b g ft

HOMOGENEOUS GRAFTS

Cadaveric grafts Homogenous sources for bone to repair cranial defects have been limited to cadavers. During the first World War Sicard and Damborn (247) performed 10 cranioplasties using autopsy skull bones which had been placed in xylol then formaldehyde and sterilized by moist heat at the time of operation. They reported no reaction of the tissues and no absorption of the bone (241-244-245-246-248-249-250). Unfortunately however a late follow-up of these cases is not available. In 1933 Pankratiev (243) from Russia reported 4 cases of skull defect repaired by cadaver grafts. Gurdjian (242) used boiled bone from an autopsy case in 2 instances in 1 of which the bone was absorbed.

HETEROGENEOUS GRAFTS

Ossaceous grafts From time to time bone from lower animals has been transplanted into other species including man. In 1893 Ricard (256) put bone from a dog into the human skull. Schmidt (271) in 1893 transplanted fresh and decalcified bone from the rabbit to the dog and vice versa. The grafts were well tolerated by the host. Kuettnier (254) successfully grafted bones from apes to man.

Senn (257) in 1889 attempted to fill aseptic osseous cavities in dogs with decalcified tibia. Although the graft was absorbed it served for a matrix upon which new bone was laid down.

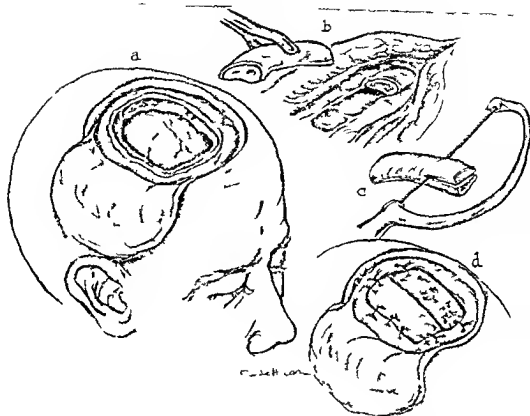


Fig 8 Ill t u h gth tech q f p p
th k ll () bt na g p f b (b) plst t ()

d pa gth d f t with th pees f nb (d)

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m d l gth l ft v th r b d bt n d
segm t f th rib Th was th t t fit th d f t
Al gth p nph ry f th g ft d th m gun f th
d f t w pl d m ll drill h t th h wh h k
t w ins t d t fir th g ft pl Th calp
w l dw th tw l y rs f l k s t sw th t d g
(Fig 9)

Th w und h led by p m ry t t th t th
ccumul ti f flui be eath th scalp At th tum f
th p u t d sch g th f th pot p t d y
t t m t es l t w y g t f y g

Ilum grafts The ilium w s apparently not used as source f bone for c n opl sty until Mauclaire (177) in 9 4 ep ired a cran al def ct with a g ft from the crest of the il m Plemister (180) used the outer table and P ck ll (8) the internal table of the l of the ilium Naffz oe (179) Mon v (178) nd th s (6) 175 176 18) ha e also used this bon a a u e of grafts for the r pa f skull defects It ha c ta n definite ad ant ges cr th e of the t b r o rib in that la ge concavo-conve grafts may be obtained

which pproximate the contour f the sk ll (F 10) The p cedure has the d sadv tage that tw ope ati e teams are necessary the convalescence s del yed b cause of the weakness of the th h muscles and fracture of the pel s may result if too strenuous act vity is en ged in early One f Money s (8) patient sustain d a fractured pel is d ring a convulsive t t ack soon after the operation

Scap la g ft The scapula a a so rce of bon f r cranioplasty ha the ad antage that it is co ered by per o teum on both s des a d that rela tively la ge p ces of bone may be obtained R eple (190) introd ed its use in 19 a d since th t time it h s been u d by a number of ope rators for cran ioplasty (69 83 184 185 186 01)

Ster im g afis M eller (87 188) reported 2 cases of cran i defect epaired by graft fr m t. st num in 9 5 Weste mann (9) ment ons th st num as a source of bone fo cr n i plasty Mueller (188) in 9 9 reported 7 ca es in which

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Fig. 9. (C) Postoperative roentgenogram of the skull showing the bone graft.

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Kuemmell (75) in 1891 and a year later Darkscheitsch and Weidenhammer (192) are said to have used decalcified bone to repair cranial defects in man with satisfactory results.

Many reports of grafting of boiled animal bone into the human skull are in the literature. In 1889 Jaksch (253) implanted eagle bone into a trephine defect. Grekoff (252) transplanted calf scapula bone in 2 cases for repair of a skull defect. Westermann (191) says he used animal bones but gives no detail. Babcock (251) perforated and boiled the scapulae of sheep and oxen for his soup bone cranioplasties. In the first world war Villandre (18) used the skull and scapula of sheep. As mentioned previously Ricard (256) made an immediate repair of a cranial defect with the ilium of a dog. Reynier (255) took the scapula of a rabbit to fill a small skull defect in a human being.

Ivory grafts. Following the experimental studies of Marchand (392) Ieln and Wakabayashi (20) Kampitz (263) and Henschel (261, 62) showing that horn was well tolerated by the tissue. Henschel (26) and Rehn (68, 269) each used it to repair skull defects in 2 cases. Henschel (261) used buffalo horn and Rehn (69) used ox horn—both of which are largely keratin. Both authors report satisfactory results after more than one year. Henschel stated that tortoise shell might be used but no one apparently has followed this lead.

Ivory grafts. Experimental studies of Schmitt (7) and Kampitz (63) showed that ivory caused no reaction when transplanted to the scalp of animals and Koenig (264) found no unusual reaction when it was implanted in the long bones. Maull (66, 267) gives only a brief report of its use for cranioplasty with statistical satisfaction. The results were. David (59) maintains that ivory is also best.

Oil substitute. As examples of the remarkable tolerance of an animal and human tissues for foreign bodies it may be mentioned that hard rubber or gutta percha (7, 6) plaster of Paris (27) shell mica (9) gum cork (65) and calcium phosphate and calcium phosphate in olive oil (23) have all been suggested and the majority of them used for cranial plasticity with some degree of success.

ALLOPLASTIC GRAFTING

The value of an all-plastic graft for the repair of a skull defect is quite obvious since the heterogeneous product does not necessitate a second operative field. The difficulty in obtaining an intimate contact for such a purpose appears by the great number of substances which have been

tried at one time or another. The ideal alloplastic graft should have the following characteristics:

1. It should be quite inert, be neither chemically modified nor dissolved by the tissue juices. It should cause little or no immediate or late tissue reaction.

3. It should not be epileptogenic or carcinogenic.

4. It should be sufficiently rigid to maintain its contour and yet sufficiently malleable to permit molding at the operating table.

5. It should offer little or no resistance to the rays.

With these criteria in mind the various alloplastic substances used for cranioplasty have been examined.

METALLIC GRAFTS

Gold and silver. The use of precious metals silver and gold dates from antiquity. Silver has been used in numerous ways for many years not only for cranial plasticity but for hemostatic clips, vessels, Lambert and Raynal (38) in 1900 recommended it for the repair of skull defects. In France Sarraud (6) and Sebile (39) used a large number of cases. Mitchell (32) used it successfully in 6 cases. Although it appeared to be relatively inert in the tissues the various reactions on the part of which formed the silve. An added disadvantage was found to be the discoloration of the skin which appeared over silver plate several years after it had been inserted. Recently Podarian and Manes (324) reported results and called attention to certain toxic effects. Flegle (31) has also recently used silver for repair of the cranium. Neither silver nor gold is desirable for painful large defects because of its stiffness.

Gold is considered better than silver for cranial plasticity (331) and said to be well tolerated by the tissues (33). A number of writers (317, 345) have reported satisfactory cases of repair of skull defects with this metal but the only large series that Estro (34, 35, 36). He reported using gold for the repair of skull defects. He had 4 deaths and in 2 cases he had to remove the plate because of infection. Although gold and silver were used by French surgeons in World War I they have been employed very rarely in the past few decades (30, 33, 38, 330, 33, 393).

Aluminum. Although aluminum was the first metal to be selected for cranial plasticity it has not been employed extensively. In 1893 Booth and Curtis (37) reported a skull defect with aluminum. Two years later Lambotte (30) reported a similar repair. The only subsequent re-

may clear up by the use of chemotherapy or penicillin without removal of the plate (272 274 278)

Since tantalum cannot be shaped at the operating table except with great difficulty the plate must be preformed. Small plates may be beaten to a simple contour by hammering over a model made from a plaster of Paris impression of the patient's head in which the cranial defect has been corrected. This may be accomplished by building up the contour of the head with clay before the mold is made or filling in the defect in the positive impression. The first method is probably the simplest and has the added advantage that the margins of the defect are well delineated by particles of clay adhering to the plaster. Lipscomb and Grover (296) have made the positive mold from an impression obtained with sterile agar at a preliminary or first stage operation. This technique requires a second operative procedure for the insertion of the tantalum. Large plates require shaping in a negative mold made of stone fixed in a metal casting to prevent breakage. These plates may be compressed by a heavy rubber pad or by a positive stone impression as described by Schnitzer and McCarthy (87). Crimping of the margins of the plate may necessitate the removal of V shaped notches where the greatest curvature is present. This does not materially weaken the plate and allows easier manipulation if the contour is not perfect.

The plate is cut to allow a one eighth or one quarter inch margin about the entire defect. It is then perforated every 2 or 3 cm with drill holes from 2 to 3 mm in diameter. Oil films that have formed on the plate should be removed with ether or any oil solvent before sterilization.

There are several acceptable methods of mobilizing the plate. The simplest is to tie the plate to the margins of the skull with tantalum wire. Since the plate is only 0.5 inch in thickness it cannot be seen or felt through the scalp. When used in prominent areas such as over the forehead a ledge may be cut in the outer cortical table to allow the plate to fit flush with the skull. It may be held in place by wires soldered or fixed by small triangular pieces of tantalum driven into the diploic bone (286) (Fig 11). The edges points may be used as nails as they are driven into the skull at the edge of the plate and then sent over the tantalum sheet. From three to six such points are usually sufficient to hold the plate firmly in place.

Tantalum. In 1936 Venables, Stuck and Beck (34) used the electrolytic method as a method of determining their corrosive and tissue reactions

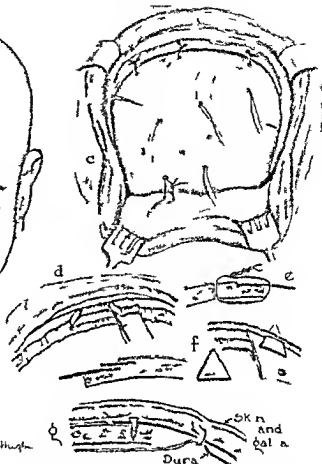
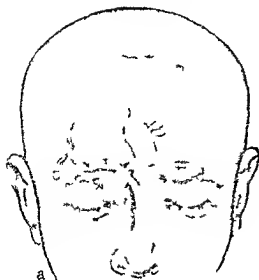
concluded that the alloy vitalium composed of cobalt, chromium and molybdenum and which caused little or no electrolytic reaction was comparatively inert in vivo (299 300 301). Although it has been much discussed of the electrolytic method as a means of testing for corrosion and tissue irritation (9 9) the inertness of vitalium has been fully substantiated (94 95 308). No undue reactions to it have been reported. Accidental infection not attributable to the plate have not prevented wound healing about the metal.

Geib (295) was the first to use vitalium in the repair of skull defects. Because of the rigidity of the alloy the plate had to be cast from a mold. Further shaping was allowed for by narrow strips cut radially about the periphery. In each of Geib's (95) cases a slight accumulation of fluid beneath the flap required a pirion about the third or fourth postoperative day. At postmortem examination in 1 patient eight months after cranioplasty the plate was found to have the same high lustre as when implanted. It was covered by soft fibrous tissue which peeled off easily. A small defect present at the primary operation had been closed by granulation from the margin of the dura mater. Tantalum has been used on a number of occasions with good results (297 98).

The necessity of casting the plate from a precise mold of the skull has prevented many new designs from using this technique (80 296). To avoid this difficulty Beck (9) suggested a stock supply of vitalium strips, many of different thickness and varied width and length which could be bent with pliers and used in a primary or cranioplasty. These strips fashioned into the desired contour may be placed about 1 or 2 mm apart.

Titanium. In 1941 Campbell, Melowsky and Tompkins (38) reported on neither alloy titanium composed of nickel, cobalt, chromium and molybdenum. This alloy was shown to be practically inert and nontoxic. In a series of animal experiments they found that titanium (about) produces fibrous encapsulation very similar to that of tantalum which was used as a control. When embedded in the cerebral cortex a slight margin of tissue developed around the sac enclosing the metal. In the worst form titanium is malleable. However its clinical application has not been reported.

Stainless steel. Boldy (96) has recently suggested the use of stainless steel wire mesh of varying gauze for the repair of small cranial defects. Such sections may be cut and molded at the operating table and are said to produce excellent cosmetic results.



Fg Sk t h h th t h q f ta tal m
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k l l (c d) t g t g u l p g s f t a t a l u m (f) r
fast m thepl t to the sk ll by t a n a l u m s c r (g) Th
m thod f l m t u th d d p b th th plat by
tur f m th d m a t to th c l p b (f d x)

NONMETALLIC GRAFTS

Nonmetallic alloplastic grafts have been used to repair skull defects for many years with considerable success. Their light weight and flexibility have won many adherents for them. Some of the more recently developed plastics give even greater promise.

Celluloid The introduction of this plastic for the repair of cranial defects is generally attributed to Fraenkel (339 340 34 34) Due to its availability and flexibility it was enthusiastically received at first in Austria (337 338 49) then in Germany (343 346 353) and later elsewhere (333 335 54 355) Complications apparently were few but time revealed a few disadvantages of celluloid Although several operators have followed little reaction to the plastic on re-exploration after several years (354 355 360) Funke

(344-345) described a marked change in a plate used for cranioplasty five years previously. The celluloid was thinner and its smooth surface pitted. The plate had lost its elasticity, it was soft and so brittle it could be crumpled between the fingers. Chemical analysis showed that the plate had lost camphor. Experimentally, the tissue reaction to celluloid has been studied (347-350, 357) and shown to be rather slight. Six days after implantation the celluloid is surrounded by granulation tissue containing newly formed vessels and polymorphonuclear leucocytes. In four weeks the connective tissue has become laminated although it is still infiltrated by inflammatory cells. In eight weeks the plate is surrounded by a thin lamina of pale connective tissue (347). Following a craniial repair with celluloid however a serosanguineous exudate forms about the plate.

which requires almost daily aspiration for from one to two weeks. If infection does not result from this treatment (334) the plate usually becomes encapsulated with connective tissue. This immediate cellular reaction is much greater than that seen with autogenous or alloplastic cranoplasty using tantalum, vitallium, or methacrylate. Before the introduction of these newer materials, celluloid was used extensively (56, 112, 336, 348, 357, 352, 355, 356, 358, 361). Ney (355) reported a series of 300 cases of celluloid cranoplasty with only 5 infections. Four of the patients were subsequently reoperated upon with satisfactory results.

Methyl methacrylate. The acrylic resins have been known for many years but it was not until 1937 that they were generally used as industrial materials. Because of their properties it was soon recognized that they were ideal for dental prostheses. The lack of tissue reaction to these resins in the mouth suggested that they might be successfully implanted within the body for arthroplasty and cranioplasty.

The methyl methacrylate resins made from bases derived basically from coal air and water. These are converted by high pressure methods into a clear liquid—methyl methacrylate monomer. The trade names under which this particular type of acrylic resin is known are Lucite, Lucit, Plexiglass, or crystallite. In the processed form it has a tensile strength of from 4,000 to 7,000 pounds per square inch and compressive and flexural strength of from 10,000 to 15,000 pounds per square inch. The plastic begins to soften when heated to about 50° F. Methyl methacrylate is not affected by weak acids and alkalies but it is soluble in ketones, esters, and aromatic hydrocarbons. The plastic absorbs small amounts of water with which it contains its chemical structure (365).

Kleinschmidt (370) was the first to report on the use of methyl methacrylate (plexiglass) in experimental animals. In January 1941 he presented plates of plexiglass 1 mm. thickness in skull defects of rabbits. In ten days the infection of the plate was covered by intact cells living in a plasma mat. Collagen fibrils appeared in three weeks firmly enveloping the plate. Although the tissue adhered to the dura mater the subdural tracture showed no reaction. Kleinschmidt (370) stated that Zander was the first to use this plastic for human cranioplasty reporting a defect in the frontal bone in October 1940. In this country, with plastic surgeons (367, 368, 372) introduced the newer plastic for arthroplasty. In this country methyl methacrylate has been used

for several years (175). Originally flat plates of lucite 2 mm. in thickness were processed and then shaped by heating over a plastic mold. Because such plates tended to flatten during autoclaving the lucite is now processed in casts of the head such as dental molds are made. Gurdian et al. (366) and Kahn (369) have used methacrylate successfully for cranoplasty with good cosmetic results. Kahn believes the material to be so inert that it may be inserted at the time of primary repair of a perforation without infection of the head.

While acrylic resins are well tolerated by human and animal tissues (362, 363, 364, 370, 371) there is a definite encapsulation of the plate within a few weeks by hyaline connective tissue (F 12). Relatively little inflammatory reaction is present. That this tissue response is more than that seen when tantalum or vitallium is used cannot be stated from the few human cases in which they have been able to make biopsy studies. The plastic does not appear to invoke a foreign body reaction even in the presence of infection. We have seen an infected wound probably due to too early acrylic cranioplasty for a compound skull fracture clear up completely with local systemic penicillin therapy without removal of the plate. It is particularly noteworthy that following repair of a skull defect with a methyl methacrylate plate a patient of fluid under the flap always required more than once and in some cases not at all.

The acrylic plate is cast from a mold made of the patient's head. A plaster of Paris impression of the cranial defect and surrounding area is prepared and molded in a plaster mold. The mold is pressed down 5 mm. to allow for the thickness of the scalp and the defect filled in to approximately 1 mm. of the desired contour. Base plate is laid in to fill the defect. The mold is greased and the contents of the mold is prepared by making an impression of the mold and wall in the defect. Upon separation of the flask the wall is removed and the adjoining surfaces of the molds are smoothed by hand with sheets of fine linen.

The acrylic material prepared by mixing the polymer (polyethylene glycol) about 8 cc. of the mixed material makes a plate about 2 by 6 by 50 mm. The thickness of the material is placed in the mold and the contents of the mold applied. The two are then impressed by heavy clamps and placed in water bath at approximately 100° F.

The following is a list of the authors who have used acrylic plates in the treatment of skull defects: Gurdian, Kahn, Ney, Kleinschmidt, Zander, and others. The following is a list of the authors who have used acrylic plates in the treatment of skull defects: Gurdian, Kahn, Ney, Kleinschmidt, Zander, and others.

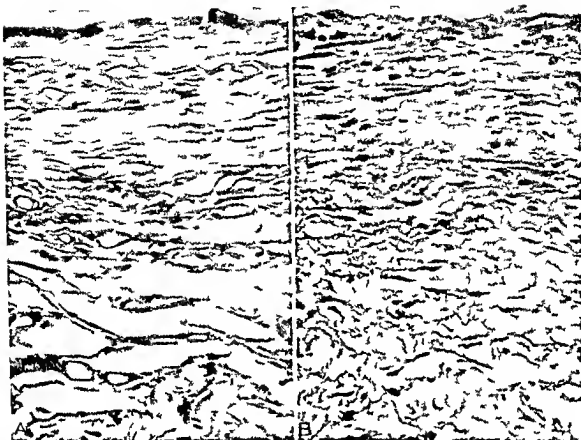


Fig. 1. Photomicrographs of the tibiae of the patient (A) and of the tibiae of the patient (B). H. M. T. Y. L. eos. X 500.

160 F for one hour. They are then boiled about forty five minutes. Slow cooling prevents stresses or strains in the material. Upon removal of the plate the margins may be trimmed and the outer edges beveled. The surfaces are polished on a wheel. Perforations are made about 3 cm. apart.

Sterilization may be carried out by immersion in sterilizing solutions. If autoclaved the plate should be bound to a small mold to prevent distortion. The wet heat produces a slight translucency of the plastic without otherwise altering its strength and consistency. The plate is inserted and fixed in much the same manner described for other all plastic grafts (Fig. 13).

POSTOPERATIVE TREATMENT

When osteoperiosteal fragmented grafts of the skull are used to repair cranial defects it is advisable to prevent undue pressure on the graft until bony union has occurred. For this purpose a plaster of Paris cast may be fitted to the head for

the immediate postoperative period. Later a plate in the patient's cap will afford adequate protection for the defect until the graft has become solid (381). When more solid grafts such as ribs, tibia or ilium are implanted this precaution is unnecessary. For such grafts and alloplastic cranioplasty a pressure bandage with sponge rubber sea sponges or mechanical waste to obtain an even compression is placed on the head to prevent the collection of fluid under the scalp. If the patient is kept flat in bed for the first few days following cranioplasty the dura mater will tend to remain in contact with the plate and thus eliminate the dead space. If the patient is elevated the intracranial pressure is decreased which allows more fluid to drain under the plate. It is true that the dependent position predisposes to venous ooze but the use of a pressure bandage and the intracranial pressure tend to keep this bleeding to a minimum. The compression bandage should be left in place until the sutures are to

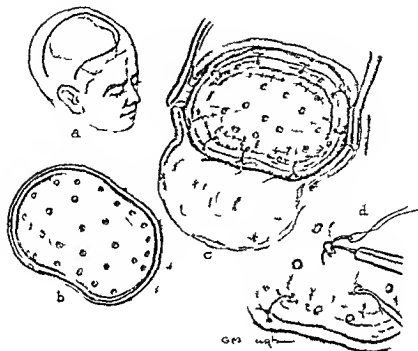


Fig. 3. Sk. th. t. h. th. t. h. q. f. r. y. l. n. u. p. l. t. Aft. f. t. g. th. calp
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be removed in three or four days. If considerable fluid has accumulated under the scalp at this time it may be aspirated and the pressure dressing replaced. With osseous tantalum and methacrylate grafts aspiration is rarely required on more than one occasion at different times.

Since many cranioplasties are performed for the repair of cranial defects due to compound fracture of the skull, which has a certain amount of infection has been present, it seems advisable to prepare the patient for operation by systemic administration of moderate doses of penicillin and sulfadiazine. This is particularly imperative if the period of time since the infection has been short. The local application of these hemostatic agents in the wound has been recommended.

DISCUSSION

Perhaps the most common finding in a review of cranial plasticity is the great tolerance of human tissues for even bodily (389). This is undoubtedly the reason that so many different types of graft have been tested and used for repair of the skull with successful results. To

choose the ideal from these is no easy task because none meets all the requirements of a perfect graft. However, the comparative results of some appear to be more reliable than others.

There is no doubt that the alloplast can be molded to more complex contours to produce a cosmetic result superior to that obtained by other types of graft. Such shaping of the graft is

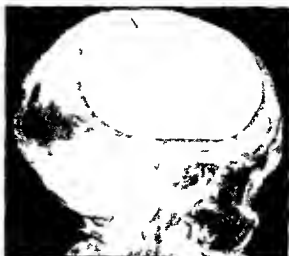
especially necessary in the frontal region and for defects in this region all plastic grafts are particularly desirable. For defects in the parts of the skull where the cosmetic results are not so important the advantages of alloplast cranio-plasty is not evident. The introduction of a foreign body even if it is eventually absorbed is responsible for the development of carcinogenic potential or other sequelae. The lack of an immediate tissue reaction is especially important in animals. No guarantee that a late reaction may not occur. The somewhat simpler and more permanent procedure when a permanent plastic is selected is not necessarily a adequate reason for its use. The standard for cranial plasticity defect up to 8 mm diameter may be repaired at a

single and not too lengthy operation with osseous grafts either from the skull, tibia, ilium or ribs. For repairs of smaller cranial defects the osteoperiosteal grafts from the outer table of the skull seem to be well suited. That osseous grafts are absorbed in 5 per cent of the cases does not seem to be a serious disadvantage. For the repair of large defects for which sufficient bone can be obtained only with difficulty the alloplastic grafts are desirable.

The choice of an alloplastic graft is not easy. Only celluloid which is obviously inferior to the newer plastics and metals has had the test of time. That all the others will remain inert in the tissue for from forty to fifty years remains to be determined. All of the newer materials—tantalum, vitallium, ticonium and methacrylate—appear to cause relatively little immediate tissue reaction. The metals and alloys have one distinct advantage not possessed by the plastics, namely their radio-opacity. If roentgenograms of the skull are not required following craniotomy this is of no consequence, but if a complication develops the large mass of radio-opaque material is a severe handicap to adequate roentgenographic examination (Fig. 14). In cases in which the dura mater has not been penetrated late sequelae such as epilepsy are unlikely, therefore metal plates may be used for repair of the skull defects with little chance of their interference with subsequent roentgenography. However in those cases in which the dura mater has been penetrated of which about 40 per cent will probably develop epilepsy, a radiolucent graft such as methacrylate would seem desirable. Although both plastic and tantalum plates appear to modify the electroencephalogram the alterations do not seem to be sufficient to interfere seriously with the interpretation of the record. Perhaps as the result of World War II more definite information on the advantages and disadvantages of the various methods of grafting will be made available. At the present time the choice of graft appears to be largely a matter of personal experience and opinion.

KEILRENDS

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JOHN R L D M D

NOSE AND SINUSES

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J H V F D LPH M D

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PHARYNX

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th r app e r n n th a th ca s n r
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dm t l l

In 19 patients treated with penicillin, 11 patients with ampicillin, and 7 patients with cephazolin sodium, the mean duration of symptoms before treatment was 4.4 days (range 1 to 14 days). In 10 patients treated with penicillin, 10 patients with ampicillin, and 5 patients with cephazolin sodium, the mean duration of symptoms after treatment was 4.4 days (range 1 to 14 days). In 10 patients treated with penicillin, 10 patients with ampicillin, and 5 patients with cephazolin sodium, the mean duration of symptoms before treatment was 4.4 days (range 1 to 14 days). In 10 patients treated with penicillin, 10 patients with ampicillin, and 5 patients with cephazolin sodium, the mean duration of symptoms after treatment was 4.4 days (range 1 to 14 days).

This study revealed that the value of the high
athletic test protocol to all and
emphasizes its value, dangerous hemolytic
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SURGERY OF THE NERVOUS SYSTEM

PERIPHERAL NERVES

Hirshmann L G and Gibb E W Phant m
Limb P in R Relation t h T m nt f
L rge N r es r th Tim of Ampu tion Am
J S g 945 67 69

Phantom limb pain is discussed by the authors
who present the opinion that phantom limb (at least in
part) may be due to peripheral sensation. They do
not believe that these symptoms are purely psychic
or in but that they have an organic background.
Arguments favor of a central origin are supported
by the statement that the existence of a neuroma should
prevent referral of the pain if it is a peripheral one
but such neurotomy does not seem to give satisfactory
results. Studies must indicate that the
malreflex from the peripheral to the higher centers
of the central nervous system tend to become fixed
or reversible with a short time after the
traumatic amputation with subsequent removal of
the original sensation does not always completely
abolish these phenomena.

The incidence of phantom limb sensations remain
variable according to reports from 5 to
98 per cent. In this series the authors deal only with
phantom limb pain in a different manner than
limb sensation. Secondary determinate
occasionally to primary secondary
thrombopoductive great side of phantom
limb pain the conditions are from 25
percent.

The average incidence of phantom limb pain in
this series for patients who survived amputation
of an extremity after follow-up by an adequate
period of time is 58 percent.

The authors express the opinion that the most
probable primary cause of phantom limb sensation
is in the results from the loss of the distal
portion of the limb. The authors state that the
phantom limb is a result of the abnormal reflexes
which have been established in the central
nervous system. The authors state that the
phantom limb is a result of the abnormal reflexes
which have been established in the central
nervous system. The authors state that the
phantom limb is a result of the abnormal reflexes
which have been established in the central
nervous system.

The various surgical methods of treatment of the
peripheral nerves at the time of amputation were
again reviewed. The methods employed by the
authors in amputation of the lower extremity
are as follows: the use of the guinea pig
absorbable ligature tightly around the
trunk of the limb about the site of
amputation. The ligature is then cut from the
nutrient artery and the narrow strip of
the nerve is then cut by the catheter
method. The first method was used upon the nerves

of the area of pressure necrosis by fibrous tissue until
after about one month the epineurium completely
encases the end of the nerve except for a small
area of fibrous tissue at the free end. The
distal portion of the nerve is resected with the scalp
just below the point of ligation.

Of 11 patients 113 are adequately followed up.
They experienced no phantom limb pain following
operation by these methods. Analysis of the 7
patients who complained of phantom limb pain
revealed that all but one were in the sixth
decade of life and that 5 of the 7 had gangrene due
to arterial insufficiency while 2 had extensive
arterial thrombosis in the extremity.

HOWARD A BROWN M D

BRAIN AND ITS COVERINGS CRANIAL NERVES

Adler A Mental Symptom following Head Injury
Jury A St r tle An ly l of 200 C se A h
Ne Pyh i Ch 945 53 34

A review of the psychiatric aspect of 200 cases of
head injury given as a part of other neurological
studies in connection with the same series of cases
which had been reported elsewhere. The patients
ranged from fifteen to fifty years of age and
presented head injuries which varied in degree of
severity.

Post-traumatic mental symptoms developed in
31.5 per cent of these cases. Certain pre-incident
predisposing factors seemed to play a part in the
development of the post-traumatic mental symptoms
and these are listed as follows: advanced age
marital status, certain tonal stock, certain
cupidity, a predisposition to anxiety states. The
with the mental symptoms, especially from the
group of patients complaining of headache and
dizziness.

The symptoms included in the review were the
following: nervousness, faulty concentration, fear,
anxiety, depression, hypochondriasis, obsessions,
compulsions, hysterical personality change,
hypomania and euphoria. Post-traumatic anxiety
was the largest group, the state coupled with
the frequent complaint of headache and dizziness.
The most common mental symptom in the series
these are patients.

HOWARD A BROWN M D

Gidding D H and Maxw H R
Disinfectant in the treatment of Sex re-infection
in infants and children. A review of the
literature since the introduction of sulfamides
The rapid microbiological infection. J Pediatr
St Lo 945 6

The review pertains to the treatment of gonococcal
infection from St. Louis. The first deal with 77 cases

More extensive l s s equ res a transplant Suc
cessful tech q e embrac s the sutu ng of the nerve
sheath only av dance of to sion a d angulat on
and abse c of infect o JOHN R L NDSAY M D

SPINAL CORD AND ITS COVERINGS

Raaf J T e tment f the Patl nt with Spin l
Cord Inj ry Am J Su g 945 67 63

On th basis of 63 ca es of sp al d jury an
attempt is m de t ratl n l e th treatm nt The
ca sared vid d nt n cut enes of 33 seen f om
one h ur t thrt n days afte the injury and a
chronic series f 3 ca s s from n month to
fiftee v ars after the i j ry Th fi t 33 cas smu t
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W h i V N M D

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J M 945 23 249

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ti n but by o means excl des the co diti ns found
n the second se es of cases

Recur nt attacks of pain in the lo e back a d
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ncreased by c gh g sneezing or tra n and
rel ved by est r orth ped c tr atm t are some
v hat mo e ind cative of a h nated l mbar d sc th n
of the oth c ad tion Th subjective symptoms
appear d to be of no valu nas certain g the l vel at
wh ch the di c was ruptured when rupture xisted

Lo back s gns such as lumba muscle spasm
alteration of the lumbar curve and/or local tend r
n s were f no d fferent al value in the two ies
It i of int est that the e was an ab e cc flow back
s ns e d usive of local tend ne s in one fifth of the
p ed d sand m o c th d of the other conditi ns
The pres nc or absenc of a pos tiv reaction to the
straight leg as gor La u test was lik e f no
diff ent l v lue Test which produc t mporary
i creas of the i trac an l pressu e such as c ugh
ing st aining o ju lar ompres on and r sult in a
accentuat on of p i we of co d able diff ren
t al diagn tic importa ce h i f u d positive in 86
p ce t of the hern at d disc ser as oppos d to 44
percent for th ther ser s The p enc orab ence
of moto w kn sso refle changes in th involv d
lmb w s of no d agnost ch lp d about on half of
th patients w th v n f d disc herniat o had orm l
Achil s fle s Muscula at ophy as 3 tmes mo e
p eval t i the pr ved herniat on group

Obje tiv se ory ch nges were abs nt in 37 p r
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l mb sacral uptu es but in nly o e th d of th
f u th l mb d c h n t i Atr phy was t c
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l mb acral rupt es C r brosy al fluid tud s
w e of l g ostic hlp

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Ehnl G and Lo J G Intra pln I Lipoma
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Clinical and P thological Study t h N
P j h t Ch 945 53

Very cl set i p c t of intrasp alt mors are
l pom s Th e f fths of the l p mas e intradural
a d t o fths are e trad ral

Th d t h t on h t een the sexes is ab t q l
for both va eties of intrasp al l p mas

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fewe cepto s h fo c th ge of two or three years
at the beg ning of the th rd or fifth decade Symp
tom of t ad al l p mas app ar at a yag

The dur ton of symptoms of t d l l p om s
(before death or surgical removal) r nges f om
few months to mo e th ftee years The median
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The cl ncl presson of ntr d al l p ma s
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lat l flaccid p allys of n a m assoc t d w th
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MISCELLANEOUS

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S 945 09 4

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R fl p p f r r d f om rnt t d
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S mat pa m y b c m b d w th y m p th uc
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p t c te cale mu l may b d nly

affected by local shoulder joint lesions. A b t s tend to be fibrotic. However, local infiltration into the scalenus anterior muscle will help in the scapular inferior vicular ligament and arm and ar as

If any other local abscesses at the shoulder joint is present it will not be relieved and it can then be sharply localized the overlap of vascular and neuralgia pain and tenderness of the scalenus syndrome having been eradicated from the trunk.

Low back pain is divided into the type with and those without radiation. Radiating pain may be reflex or traumatic type. If the reflex is as if pain at tenderness of the transverse process of the lumbar vertebrae there is root or trunk irritation and that therapy should be directed to the peripheral area. Paravertebral tenderness will be found at the level corresponding to the peripheral distribution. Local infiltration in such situations would be of value. Low back pain without radiation and without focal tenderness is attributed to myofascial syndromes and local infiltration is indicated.

In instances of segmental neuralgia local infiltration into the peripheral area of pain may cause cessation of pain in the segment. However, if the pain is only temporary and a paravertebral infiltration

of the involved nerve trunk will yield more satisfactory results.

Differentiation of the source of pain according to the presence or absence of tenderness has been found to be more accurate than attention to the area of pain. Thus segmental pain in an old tenderness may persist for months or years after the subsidence of the acute symptoms of a back injury. Efforts to relieve area of pain by local infiltration peripherally are of little use. However, paravertebral blocks of the nerve trunks responsible for the segmental tenderness will result in prolonged relief often curing the complaint of pain.

Failure to obtain relief of pain following paravertebral block may be due to improper infiltration of the nerve trunk. This would be recalled by failure to relieve segmental tenderness. Should segmental tenderness disappear and pain still persist it may be caused by (1) a lesion proximal to the point of infiltration which would be intraspinal such as a cord tumor or herniated intervertebral disc (2) local lesion replaced by a zone of segmental neuralgia (3) a visceral lesion associated with the segmental neuralgia or (4) unrelievedness of the part of the patient to admit relief as in compensation problems.

HEAVY A. SHENKIN M.D.

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Lubs hit K P g t Di of the Nipple with
Special R f n t It Co rs and T atment
A t d l St kh 944 5 7

During the p o d f m 9 g t 942 the n mh
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J E P K N A R M D

TRACHEA LUNGS AND PLEURA

O h l t R H nd W l n N J Pulm ry R
ecti n l n th T tm nt f T b e r c u l f /
Thor S t 94 4 55

Res t f t b l t p o c e d
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g the h lum nd th pleural fl p m thod of cl g
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 l r desper t e r ks 56 p t in the 45 p t t
 by ct d to the mp o ed t ch q e th p t
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 ma ng patie t rec ntly d l ped a b o ch al f t
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THOMAS F THORN N J M D

Sto k y P F Lockwood I H Mant H L
 Buckingham W W and Othe P n l illin
 Th rapy in B nchie ta l S // M J 945
 38 93

Bact i l g cal f li g in th sp ta of 21 ch c
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 most common fou d Nonhemolyt e a d hemolytic
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 were not d Bacter log ly the c was a decreas
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 top clln T om s F Th nro J e M D

Ty n M D nd Millik n N T T tal Pneum
 nectomy f B lgn Br nchial Ad n m Case
 R p t t m J S g 945 67

Tho gh h ch lad oma has b come definitely
 s p rat d f m b onch al cancer a d other b n gn
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 bu ed w th d p r y th apy ord ct rad m im
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the size of the thoracic cage at s ch a t m l d
not b f b e t t

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p t d u i a d h v t h t i y l a g
H only u b y c t d i f f i c u l t y t h a t f h l k a j
i d l y u p a s t e p h i l l t h r i o m e h t s f l r t h
a d h e e z g T h e c i n c i d c f r c n c r
m e t a s t a S h e i a b l e t o c a r y u t h r h k
a d h d u t e s a s t e l p h o n p e a t r t h o t
p i a t y m l a a s s e m t S h e h a d a m a l d e r v
a d p e p i u m A p r i l 1944 T h c t c a l c a
t l i n e t h e r t h e l u g i s u i n t h s a l l e n t u a l l y
b k d o b e c a f r u p t o f t h l a t t u c
f m o v e r s t r a A g a t t h i s p a b i l i t y t i t
t g t n o t t h a t t h e p a t i e n t v i t a l c a p a c i t y a n d
a b i l i t y t o c a r y o t h e r l a v c t a t h e m
p o e d p o g c s s e l v t h f o u r y r s f o l l o w i n g o f
c r a t i o C r L S B u r v M D

Nel on W E and Smith L W G n l d
O b t r u t i E m p h y m a i n l f a n t s J i d t
S L o s 1945 6 36

Acute and h n r r a t y d t u b c s n
v h c h t h a c t i c l i c a l m a l l s t t a n
e x p l a t o r y t y p e l d y p a a s c t e d v t h g e r l
d e m p h y m a r n o t c o m m o n i n t h e f i r s t l
y a r o f l i f e T h e t i l v a s t c n s d b l e
c i n t T h e s p a t r y b i c t i s p p l y
i n t h e d t a l o m a l l r b c h l T h a
n u l o b s t r u c t t o b o t h p a t o n a d p a t n
b u t t h e d i f f i c u l t y p t n t h e m e r r m t
d i r i s t r a p p e d n t h a l o l a d p d m
p h y s e m a T h e m k d a t n t h e d
g r o f b s t c t i o n a l l s i t h e t o l t h
o b s t c t g l e s s t h a t o t l y d t h d g c
o f e m p h y s m a y b u t n t h a m c e t h r
f r e q u e n t l y a r a o f t e l e c t s i s s w l l m p h y
s e m A t e l c t a s t u a l l y f l w t h m p h y m a
h n o b r u c t n i s o n p l e t n d t h t r i p d a l
l a a r b s b e a b s b d

Cases f b s t r c t e m p h y s m a h t a
l c a l l e a t u r i o m m o n T h r e s d
r e p i r t r y a t e a d m a k d l y r e s d p t y
a c u s s s c i a t e d t h u t i l a t i n f t h e c
s o y u s c l f r i r a t o n I n c n a t t l r v g a l
o b s t r u c t i o n t h e c s u a l l y n h o a r s r s t
d r a d n o i t t t s t h m a f q t l y
a u d b l w h g C y n o d p d s i n t l i
g r o f t h e o b t r u c t T h p u i t i
h y r n t c p t o c r l o c a l i a e t f
s o l d t n a d t h e r p r a t y m u m h c
t e n l b y a p l o n g t a n a d s s l y r g h b
o f t h e p t r y p h a c T h m y m t b
n n m e d i u m r a l e s O t h e t g m t h
d f h r g m n t o b e l a d f l a t t d t h b
f r t h e a p a t h n s l a f t h l g t l l
d T h m a v m y t b t l g t t h y
a s f d n i t y n l a t l l g a f
a t l e t a O n f l u s p t h r i s r t t l
e c u r s i n f t h e l d i l t t l d t h r a g m
i n t t h o r s p r c t h t p l a t r y
f s t r b a f r f m u m l h l t h

may i t y l t h e i n f n t s b e r v d h a v h a i a n a c t e
I f l m t e d c o s e u a f f t e d b y t h e u l f a m d e
I s t r o g l y s u s t c o f b n g t h e i f n t i l c o u n
t r p t f i n f l u a l (v r u s) p n e u m o n i t s o r o f s o
c a l l e d p r i m a r y a t y p c a l o r l p e u m o n i a t h e
h a b e e n a v a t y f p a t h o l o g i c l c o n d i t i o n s w h i c h
h a v b e e n r j o n b l e f o d p n e a i n a s s o c i a t o n i t h
t h e b r u c t e m p h y e m a

C a s e h i s t o r y a l l s t r a t i n g c n d i t i o n s i n w h c h
o b s t r u c t i v e e m p h y s e m a n i m p o r t a n t f e a t u e a e p r
e n t d T h c l u d a s p t i o n o f l g a m o u n t
o f a m i o t c f l u d a n d i t c o t e n t d u i n o r j u s t
p r i o r t d e l e r y r e s p a t o r y f e c t i o n s o c i a t e d
w i t h c y s t i c f b r s o f t h e p a n e a s c u t e b r o n h i l
t i (i n t r s t l p n u m o n i a) a t y p i c a l f o r m s o f a c u t e
t a c h e o b r o c h t i a p i r a t i o n o f z e s t e r a p e d e r
a n d c h r o n i c p a s s e v c o n g e t i n s e c o n d a r y t o a c n
g n t a l c a d i a c l e s o n I n t h e f a t a l a s e t h e g r o s
a n d m e o s c o p i c e x a m n a t o n o f t h e l u n a e d e
s c r i b d

W h e l a r g e q u a n t i t i e s o f a m t i f l u i d a n d i t s
c o n t e n t s a e a p i r a t e d i t o t h e l n g b r o n c h o s c o p c
a s p t i n w i l l b e h e l p f u l n c l r n g t h t r c h e a n d
l a r g e r b r o c h i o r i t a t c h e a l a p i r t i n n b y m e a n s
o f a c a t h t e r p s s d t h r o u g h a l a r y g c p e m a y b
p e l a b l e O y g n w i t h c a b o n d i d e a d d e d e a c h
b u t c n t c t h d r y n g f e c t o f t h e o x y g e n i
n e d d I n c s e o f a c u t l a r y g o t r a h o b r o n c h i t s
b o h o c o p e i t r t a h e a l a p i r a t n i s i l
c a t d T h m a j o r i t y o f i n f a n t v t h a c u t b r o n c h
h i t s h o w l a c k o f l a b l e r s p n s e t t h e s u l
f o a m d f n e E a r u M D

R o b t J E H T u b b O S n d B e V l
P l u r a l a c d P u l m o n a r y S u p p u a t i n T r t d
w i t h P n c i l l i n L e t d 1945 48 39

P n c i l l n a p p e s t o l o w e t h e n e d e o f f e
t i n i c a s e s o f t a m a t c h e m o t h a w h i c h i s
a c o r d n e w t h t h f i n d s o f t h r i n v e s t i g t r
T l e c a c e o f c u t p v o g n m p j r
t r a t d l c a l l y t h e n c l l i S t l t o i s u a l l y
b t i d a d l y b u t a p a t o a n d i t a p l r l
i j e c t n o f p c u l l n l e e l t s m u h p l u r a l
t h c k i g t h a t o p r a t e c t m t s r e q u i d a
n a t h c k p u s f r m s E u a t i f l l i b r n n d
s u b s e q u e t l r f t h e o u d m y p v s t
f a c t o r y i n s m e c a s b u t t h e m t u n f o r m l y g o o d
e u l t s a l l p o b l y b e o b t a n d b y t r i a g e I n t a
p l u a l c l n u l l c l e a l y p l y i t s m o t m p o t a t
d l c s e s d g o d a t e a r l y s t a g w h n t h e
f l d s s t l l t h a n d l y c l i n h a n t c c u r d
T h s i p l s p a t c l a l y t o t h s e c a s f s t r p t o
c a l g n t h a t u l l c t v e p o c l o c s
e s j c l l y n c h l d t h a g d

I n t r a l e u a l p c l l n i a v l a b l a g t i n e r a d
c a t n g c d a y s f e c t o f m t u b e r c l o u p l u l
f l s o n s

O t h e r l c a l c l l c t n s o f f i t h e h s t g
t h m p h i c a n g t h r a c p l a t y m y b e p e r m a
t l y s t l u z d h y p e n c l l n
T h s t m i c a d n t t n f l l i n c a s e s
f f l m n a r y s p p r a t q u s m u h f t h r

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Daniel R A Jr and H lb ook T J Th Pr n
 tl n of Staphylococ us Inf ct on of th P ri
 to m S f y 945 7 39

Because of the diffi culties f evaluat ng th effect
 of bacte iostat c ag nts h char mplant d m c n
 tamated vou ds a d bec se org nisms tro
 due d i to w nds of th kin and subcuta eous t
 su i t oduced th ough needl nto the sub
 c ta us tis es g vers to w d ly vary g lesi ns
 n d f e ent nimal D tel a d H lb ook h l eved
 that the p oblem c ll b stud ed to ad a t ge hy
 c eat ng ce ral z d and mostly lethal fecti ns of
 the se ous c tes of num ls As n ret t peri
 ments h re n the local effect f sulfa l mde l
 fath le a d sullad a i e upo th p event n of
 i fect n f th pleu l caviti s of d gs test d
 follow ng co t m tion with the hemolytic staphy
 looccus u us thes inv t gat mpla t d th
 sam rga sm th n th perit e lea t s of d g
 a d i t r duc d bacteriostatic age t immed at ly
 th east r

In dogs whch var d w d ly in eight th ome
 tum wa compl tely depr d f t sh l d pply a d
 su p nson f h molyte st phyl oe us a
 i e n orm ls l eolut o n nected mong
 the lo ps of test e Wh a drug was u d it a
 i t r duc d m m l iat ly after the orga sms w
 i j eted

The fi ts f sulfonamides n p event: g f i l
 staphylococcus ure s p to tis n dog ted
 s rpr se i smuch as sulf thia ole w s les flecti e
 than sulfa lamide o sulfadiaz ne Th d metri
 cally opp ed to the findi gs n empyema of dogs

Total g ne lized pe iton tis occur d most fr
 qu ntly i th go p of a mals treat d with sulfa
 th a ole a d least fr q e tly in thos tre ted w th
 sulf lamde The low st m t lty ate i a y
 group m e ver oc rrd in nimal t e t d by
 mea f s lfa lam d g n by m uth add t
 to local application f the drug

S EPHEN A ZIEMAN M D

GASTROINTESTINAL TRACT

Vid b k A Solit ry nd Multipl Ca clin m f
 th Uppe Alimentary Tra t f i d f
 Stockh 944 5 330

I the t l e years f o i 93 t 942 th r w e
 s en and treated at the Rad m C nte i C pe
 hagen r 3 3 pat t th ca c f the ppr l
 ments i tr ct that f i h l p th m co m m
 br c f the r l e a ty d th t gu th t l
 l a r g n th mes ph n i h j x h a r n l
 th es ph gu d d g th ca d i this co
 t n the mesopharynx nd h poph ry are nd r
 t xod compr ng th ba f th tongu th p

gl tti (both ts ventr l a d d als rfa e and its
 fee m g) th epiglott c valleculae the aryep
 glottic l l the p riform recesses and the a yt noid
 and postc icoid regi n b ides the late land po
 te ior walls f the m sopharyn and hypoph ry n

The s te of these cancers thus comp ses a reg n
 e te ding f om the apertu e f the mouth to and
 incl d g th card a a eg n which phy iolog cally
 may be con d ed as a wh le since the cavities
 ch efly s ve for the passag of the f od particl s be
 fo they e s by cted in the stom ch to mor
 le gthyp c of digestion They a at m cally pr
 sent un fo mty nssofar as that th mucous mem
 br e th o gh o t co s ts of e eal layers of a
 nonk at izz g sq am u e llepith hum The only
 e cept n t this a e the l p hich are co cr d with
 a mod fied mucou memb a e and i hich p haps d
 not st ctly speaking form p t f the alimentary
 t aet Th rea n fo clud ng th m i the fi d f
 the invest gat on s the milarity of tract e of ca
 cin mas f the l p and ca c n mas of the o al cavity

A ve of the male al h ws that th m t f
 q ent i fceance f th upper l ment v tract n
 the st e se s th es phagus C nctr of th
 esophagus s th ee to four times a frequent in men
 as in women In both s es the leation i n th
 a thoracic portion i ab ut 85 pe e nt of the
 cases In the cervical p t n f the esophagus th e
 i a cha acte stic diff eence n r ga d to the occur
 ee of ca cer n the two s s In omenth tum
 s most fr qu ntly i ated at the nt a ce to or in
 the n ek p r t f the tube i men th locat ons is pr
 d m n tely in the j gulum

In w men the t m rs ecu chi fly in the post
 e i ad eg th posteor v ll of the pharynx
 the ent nce t th es ph gu and th cerv cal p
 to of the l tte i men th s occur mostly in the
 lower l p the base of the t ngue the p riform s nus
 and the part of th esophagus f m and includi g the
 jugulum d vn to the bifurcat on In other reg ons
 th e s no d monst abl diff re c in the relat ve
 f eq ecy of the tumor in the two sexes

Microscopically the tumors are of d fferent types
 No e of th m is rel tely m frequent in o e s x
 than in th other The diff enc depe ds o ly n
 the locat on of the gr w th

Accord ng t both cl cal and e perimental e pe
 ri ce t eem pr h ble that th d e occurs as the
 es l t fa c m h ed act o of t l fact rs — the
 p d position—a d d rs gen us f ct rs—such
 as t l adco ale hol lues de tal car es lveol r py
 r h nd l dly ftt g de tal p osth ses In the
 uth s mat al lues was pat ul ly f que t n
 the an mnes s of pati t w th l p ca er (95 pe
 nt) a d carcin m f th t ngu (2 8 pe ce t)
 lles f q t in th a am eus f pate ts w th
 c e ma f th h poph ry nx and of the esophagu
 (36 pe c nt)

pinal fistulas or abscesses associated with diarrheal abdominal distention vague lower abdominal pain or upper planned fever. There may be chills or intermittent diarrhea associated with abdominal pain of the peristaltic type. The em may be dull to moderately severe lower abdominal pain associated with diarrhea, boggy mass with or without a palpable mass or a low grade fever. Finally there may be symptoms of chills recurrent or acute intestinal obstruction.

Roec t g f d gs An c p rtly pc formed ba um
meal study of th mall nt stine t gthr r with a
barium enema ill u ally lead t the corr ct d g
osis This sho ld be de ne in th cases of all pa
t e s except tho e who hav defin t b truc
tion or tho s with sympt ms imulat g cute ap
pendicit In the p sence of a ch onic c cat i g
les n f the roec t g n v t gation s ng t e th
exam at o has u ally be n dequat r the
int rp tat on in err r Al sion incapabl f how
ing some type of oent g n def ct f the intest e i
h rdly o ewh ch wo ld req ire l par t mv

There is no considerable controversy in the etiology. We do not know whether the causative agent is an organism or virus or an animal parasite. The primary attack of this unknown entity is local, gets may be by any of the routes or through the blood stream but the lymphatic system is the question to be solved. A local attack is self-evident. Before a cellular infiltration of the tissues becomes much as shown in the accompanying diagram lymphoid hyperplasia and obstructive lymphedema of the lymph nodes exhibit the changes but the content of mucopolysaccharide is not as important as at the involvement of the lymphatics.

The a th n h y l e m t o s t h e s y m p t o m s
 t h a t h y h a d o p t i o n s o n h i m g a l
 t h a p y w a s u e d b l e n l t h e s h a d t e m a
 l t h a d r g a l l e i t u s (n o t t m n l) a d s
 h a d l e o l t i f u f t h e s e p t e n t s d d a d s
 s u i e d I n t h i s r v o r s t h e s
 r e e s o g o o d r u l t e r o b t n e d 37 p r t
 W h e s u r g c a l u l t s a r c o m p a r d t h t h
 e s l t s f l l i g o t h t h a p t i c p r d t h e
 c d n m a y b e t h d t h a t 3 f t h p t n t s
 w o l d h e s u c c u m b w t h o u t u g r a s m p r d
 t h e d a t h f j f o l l i g o p e r a t l 7 t h e
 c a s e s t i s m o s t l i k e l y t h t m o e f a r a b l u l t s
 u l d h a v e b b t a d t h c n r v t m a n
 a g m e t n i e o f t h e t e t f n i l m e n t
 n d t h p r e c f i f i t u l a s n d t h a b m l t e
 C n s q e t a l l y n y c t a o f t h o p a t n t s
 w o u l d c a t l h b e b t t f i h d u r g y
 n o t b n d e T h e l e a s o p a t t s h o m t h
 r e s l t s b a t e p a t d l y c o r v t m a g
 m t e a t b e s t m a t d B u t t d o b t f i f l l
 o p t n t s o l d h a v e m i d w t h a s 7 f t h e m
 h e b e f l l g r e s e c t o f t h l e s t

I o d e r t d i d t h e q u e s t i o n f t h l b i t
o f r a d i c a l s u r g r v r s c e a t m g m e t
n t h b e c o f c o m p l t e h l i k
h t h n t t h c h g r l m t o l p e e s
t h t e s t l t l f l m t o f t h

mesentery ever recede during the course of adequate medical management. It is possible in some instances that regression of the lesion may occur but experience with the disease up to this time would suggest that complete resolution rarely takes place. However, even though operation is deemed impossible adequate medical management should be continued indefinitely as clinical improvement in an occasional patient may be nothing less than remarkable following a relatively short period of hospitalization and thoroughly adequate management.

SAMUEL J FOG LSON M D

Frimann Dahl J On Strangulating Obstruct n
of the Small Bow l with Spe ial R f rence t
Ca with P r Roentg n Finding Act
ad f St kh 044 5 48

Most agree that the on-tigen examination of a valuable information as to the type file location of the obstruct in a d in many cases even the character of the sten sis.

F practical purposes tw kinds of ile s may be distinguished () simple obstruction of the bow l by adhes n press e from outside or a pathologic process within the gut and () strangulation il u ually caused by bands wh ch eq entirely con tract two segm ts of intestine A strangulat g il us is usually caused by bands con tract g tv segm nts f the gut th incarceration of a pat f th mes ntery Iru strangulat ns nearly always invol e only th sm ll int n Th sit of the obstruction lies most f eq ntly th lo er il um and n equly th obstructio n ually locat d in the right lo e pat f the abd men A simpl obstruction dev lops rel tly slowly w th lick attacks wh l tra gulat n dev lops qu ker th p ns e mo v le t and mor e stant and th p ntis mo exhausted In the first the testinal mov mnts a e dist ct e in the latt r th per tils has been d ed f the testinal

The question arises whether both types of ile can be distinguished rologically. T answer th quest the uth revewed 28 cases of mchanical ile. Amo these there were 32 cases of strangulat ad f these 2 gave incoed iv or poo xray findgs. Th failure to visulize clear gas nd fl dils in these cases may have been due to the fact that the patients allo ng air. Also gas was probably not entering the p estenos s ect on because of presence of the gut finally an antiperistaltic movement could have repelled the gas.

In pate t v b an acut bd m nal co d to n
whom x a f l t demon t at clear gas nd flu
l els the f llo i g f dngs just f su picion f
r regulat n cil u (a) n bn mally mall am nt
f gas n the col du t th fact that the ntest nes
d tal f th t moss a shru kn nd co tr ctcd
(b) a tum lik h l w u ally n th r ght lower
abd me f r s g c ula in sh pe nd well
cum cr bed but w th ut th h r ppe iph l c n
t r f a cv t a f (c) pel c ud t

f th l n r ben ath I ve f th se n n had
ab cesses in the abd minal w ll ith pa tal rc m
pl t e jarat or f th abd n l i c n Two
develop d subphren cal scesses (b lat als sc)
and r pat nt present d n cerati The pera
tive notes occ sionally menti n d the fact that ten
s on was cessa y to t rioriz th h el

I the f t place mobilizat on f th la ge b w l
by divi on fits lat l p r t n l attachm nts is a
relatively avasc lar y c due Th only bl d v s
s is wh ch m y need to be cl mped a d divided are
a f at the spl nic and hepatic fl xus Th retro
pe ito als co d portion of the du denum w ll be
nc nter d the r ght s d n l s l d h care
fully r flect d p t r ly Th te n the side
nv l ed hould of c urse b f o a d d p r served
An ex l lent guid to th uret h th pe matic
v s l c r s gigante to th u cter d tly bel
the kid y plvisanily justit alt th igh
o t t s co r s d t the p l l t i at on
of the ple c fle the jejun m t t l g ment
Tr t z ill ofte b c pos d a d i r y t t sh ld
b avoid d Th m nte y of th lon ll b me
r th r th n d dicate as t effect d f om the
po tr abd minal w l l a d e m t b tak n l t
it be per rat d by the r act g fingers A v per
f rat o sh ld of course b clo d to i v t
pos sible b m at on of the sm ll b el th gh the
ap t e Little f a y d s s c t n lly nec
ssary l b at on f th g m o d ol The
amo nt of d s c t on c s s y th wou d f the
tra v s e l dep d s l g ly n t s du l c y
The me tum has n a c l attahm t t
t a s r c lo nd ca b lly mo d L n
th n c ary l b at of both f ure ho l d n
pro lo g th op at p d r und ly i m t
cases a d th the d q t e po ure that i es n
tial n the c p t n t ho l d add but f i t n
m nutes to th p t i g t m

I the c d pl ce ad q t mobilat f th
b l p m t th rap d format of f o s v
n h d ul l b r r l d c l s t m y s r Th u tu
mak t r j b l to t i n t t l n t y at
a lat r d te by r trap ito l p c dur
Two v of sut c unt th t o l p facilat
the subs qu nt clamp g of th p t t on The e
tures sh ll o t h p ed t th l m n f th
bowel The i o t f th i n f a d
app mati n all th t i qu d Unt g th
l n t u d l b a d s of th c l by u l
t u e s t e d i t h o u t c t f th t u p
m t the f mat n f a d ubl b l d l t y
b ch n l e n add l r k f p t t a d
h ch i l f r m th p n t f i f th l t e r
rest at o f t e t al cont nuty A h r
h i u t o l y p r m t th c l t y t m t
beb ight ll (to hes) bo th k l l
but al r s an ad q t b o l l m f r t h
s l s quent c r i l r w l b p o t i t
l a l a g f n t e s t a l c t t f th p u s m d f
f c n t l g th th f r s t l a i t h b e l l
f d s f n tly pl ble by m a l f l l ca

t i su t th t me f clousr so that it can be n
v t e f ith t ten i N c m pl cat ons occur ed
wh ch c l l l attributed to the clamp ng
clousr a d there has be n no mortal ty among the
pati nts v th p r f rated colons On patient had
leakage of i testu al cont nt postoperatively th s
as prob bly d e t the combin tion of a short
spur plus the f mat n of an abscess postopera
tively in the old s nus t act made by th shrapnel
fra m t wh ch commu cated with the vou d of
clousr (Those pat ents whose colostomi s i c e
closed w e returo d to Class B duty)

The i denc of nfect on n the e ou ds was
h gh h cau they we open i ou d m the col
freque tly a sociat d th g oss soili g of the per
stone l cavity by f cal m te al Because of this
f c t s me su ge s bel ve that complete clousr of
the l pa otomy incision v ith ext i at n of the
bowel th igh a late al stab wou d c reases the
i denc of f c t on and separat o In the o i g i al
c s ons th small series the ncid nce of nfect
tion was eq al (5 pe cent) i the g p with the
stab wou d c lostomy nd n th group th the
col t my in the l pa otomy incision

Th tremendous m unt f support ve t eatment
nec sary to carry th se p tients ver each of thei
c m pl cat ons has not been m nt ned but can
adly b m a g ed The tech cal t eatme t of
ma y f th r complicat s is usually n t d f c l t
b t th d agn s softene cced ngly d f cult The
pat nts hav all be n th igh so much that their
mag n of s fety is small a done m t b constantly
n th ale t t d t c t even sl ght ch ng s in the
g n l c d to A sl ght le t i n n a t mpera
tu c rve h ch has been fallng m y nd at a
ab ce s h ch must b f und a d dra n l
q ckly f it may be just the traw wh ch b e l s
the camel s back JON E K PATRICK M D

K y s E L J Th S n t l n f Ga Stopp ge
d r g th O t of A ut Appe d c t i s S
x 7 945 7 7

Most su g ns in p act ce del y th diagnos f
acute ppend c t until the pa n local zes and b
cau of th s the ppe dix m y perfor te bef
p tion Th uth believes that an accur t
d g osis p t localiz t n of p n can b m de
by a sv d ome th gas stoppag s r s at on
The onset f append c t i s mea s the first hours of
vague bd minal d s c m f t p i o to l cal zat n
us lly co ider d t bed e to v dist n t f t b
ppendi It a sustained colic wh ch ca seldom
besh ply localized but s r f red to the ce t r of the
abd m umbil cu r ep gast m t a i es f om
a u be ahl ache t a feeling of nagg ng d m
fort oft as o c i t l w th na sea or v m t g It
somet mes t mpor rly r l ved by the passag of ga
or bow l mo ment

The n ton f gas s t p pag al y a des t
pa s gas downwa d r ther than up a d i t ha c
t r t cally r l ed l t l f at all by wh t ga es
feces wh ch I t is th ubj ctiv en t n (a

GYNECOLOGY

UTERUS

Randall C I Rec ant on d M nag m nt of
th W m n P d p d to Ut n Aden
rcin ma J 1m M d A 945 7

The most p act cal ba fr eco ton f th
w m n p disp sel to de ci m f th utr
s ug tel by data off d m s p rt of the fl w
ge cl)

Th e r fi cas do r la hl d
d 1 5 the l mact ic p l per l by
nly 13 wome amo g a h ro b g th ough the
chang of l f

The i c d c of the de el pme t of de
ca c nom p ior to th mc paue d m d d
quate nve t at on a d eatme t wh e b
mal bl ed ng cur n w me f rty

Wh postm pausal bleed g e the
m i th a hist ry of me o h g a d ng the
cl m cter ha a th e l half t mes gr t
ch nc f ha i g dev eloped ncer th d s the
m n wh xp i e c d cra i bl i p
t the c ssatio f h l l

l the p nt tte f k l l r d g
th et l g fca ci m f f e c f e m m la
to s ca be mad as f a p phyl ct i c l r
ae co er l D agno t c tt ag t th i t
r gula ty f bl d ng he w m n c t t
men tr at aft fifty s f ge c m m l l

When pelv c l p ot my s d e t d f w ma
pat th h l d b ng t h uld be m b d
th i c r t nly hy ter tomv nd p b l v b l t l
o pho ctomy l l p r e t t h s b e q t d lo f
m t of d noca c ma the fu d s Alth gh
t e f f e ctive ess has ot b n onvnci g l v h o v n
castrat by rrad t is d ble h cr
m nstrual g lart s d cat a d g st et
t e d r ng the cl mact y rs

F h p ther s too l ttle g eral c g n t fa
f d me tal l p l y d by l ary th d l p
m n t f d n c nom f the t r u s i t s d e
s able that we ve tually re ogn z cha a t t c s
f the ndiv dual most likely to de l p a p e c i c
type fca c W th ade oca ci m f th t u
n m d h n postmenopau l bl d g rs

th re i rason t v w th gre t sup n
th se om n h have e per cel f dom f m
b t l shes d hose vul ar d ag l t i s
sug est cont nu d stroge actvity Th bl f
is b sed o the c i c t n th t th w ma h
estrogen c t mul t i n t p t th m p c l l
n t i l p th c i t t C B M l

Jo G A N u t dt T d M k n i I f
T i l l o f v g l l n n r s i n t l D k s d
T E l y M a l i g i J O b t 45 49 59

Th m th l f bt g l m
simple Th eq up m nt cess f ch m f ra



F C m f th -- g l m

t n cons ts f lightly curv d glass f r e t t o
h h s t t ch d small ubb r s ction t be t o
mic o c p l d s ea h quipped th a paper d f
a d f at (a m ture f eq al p a t s f 95 per
c t ethyl alc hol d th)

I h m a t a l e b f o any ex m n g l l r ca t
i use l The lab a e epar t l nd th pip t t s
int d ed h gh to the v g n al v ult th the bull
compres d \ the p p t t is withdr n th bull
then sl wly i mpressed The mat al th ob
t ed then p ved o th u fac f the sl le
a d f d e e l y The m t lides ar immed tly
m mers d i the fix ng l t o wh they may c
m n f r n d f nite pe i od Th v g n al p ads
r t e d th by Papan c l u s method r by
a mod heat n f it

Th cl n s a c h a d po 427 cases I o
cae a l g o e f m l g c a m l f m th
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ma k e d i f t h p a t e t i s e a m l i n t h F o l e r p
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The author p e n t s a c e f h a n l v f 4
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H F T r u M D

M t n D G P l v i L y m p h a d n r m y l n t h
T r e t m t o f C e r v i c a l C a n c e r A m J O b s
945 49 9

If the pr m s i h c h T u g b s d b s o p r
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s w h e n the o p e r a t o w s c a r r i e d t a f t e r x
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o m n i p o u s f i n g e r a t g l a n d l a r i n v o l m e n t t l e a t 5
o f t h e q d e a t h s w e r e d u e t o t h l o c a l c r v i c a l r e c
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o f c a c e r i the g l a n d s

F O R W A R D L C M D

MISCELLANEOUS

F d S C T b e T a t m n t o f P r m n s t r u a l D i s
t e w i t h S p e c i l C n i d r a t i o n o f t h A n d
g n s J A m M A 945 7 377

R e l a t i v e l y l i t t l a t t e n t i n b a b e e p i l b y m s t
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a t t b t m e f t h o v a c y c l e h a b e t e r m e d
p m e n s t r a l t e n s i n T b s y m p t m a s i g a
r e d c h a r a c t e r a d i n t e n s i t y a n l c u r i
v o s c m b t i t h e m o t e m m n c m p l n t s
b e g n e r v o u s s s t b l t y d e p r e o m o t i a l
i n s t a b i l i t y h d a c h e n a u s a a n d a f e e l i n g o f t e n s e
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G r o h l l a d F r d m i n t i n e d t h t t h e r e t i n
f s d u m b y t h e t s s u s d u c d b y t h e s e s t r d s
o p e r a t i n g d n g t h p m n s t r u a l p h a c e s r p n s
b l e T h s r t n t n f s d i u m i s a s s o c i a t e d w t h a n
i c a s n t r a l l i r f l u d s o t h a t t h s v e l l i n g f
t h v a r i o u t u e g s a r i t o t h e r e s p e t i
s y m p t o m s

TABLE I—TREATMENT OF PREMENSTRUAL
DISTRESS WITH TESTOSTERONE PROPIONATE

N m b e r P	N m b e r T e s t u	S e v e r e f S y m p t o m s	
		B e f r e T r e t m	A f T r e t m
	3	++	3 +
		+++	++
			5 +
			5
5		++++	++++
			++
			+

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Am R F A Tl p utl R glm n f Ecl mp-
ia 1 J Ob t 945 49 49

TI re i J ted i th arcl plan f man
a eme t of clamj a th r ult f h ch n m
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The pla i ba el (a) a lt ac tive c
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d) ober ti n f each cl mft c pat nt by
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ualized r gimen t r t r l a th appl t n as a
stand rd tin oft tm t

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and of a p rat on du g th t ph f th d
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(c) l m tat n f d t o e therapy to th m l l t
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(d) d lay f labor (n l e t e ue po tan ly)
u t l th pt m m co y om th cute tag
h s t k n place () j ct of l bo at th pt
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su e s f l (f) l m tat n f ope at e terv t
t e s r cluc bl m m m n l g) the f l l
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from f t t vel c k aft del r v (b) f 46
pat ents at i terv l off m to t v s r fter
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pregnanc s The c d n c of res d a n l g
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some of tl suba ut

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d de d i f t l l l h th ut f th
d m m l r k Tl f t al f l t t t
42 p r e t t sh in k d p t t t
l t l o v s he th p pl f t t
f r th h l d was n e r s glv appl d

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I A L C r M D

II b r C P Tl T a l f t l C n vative
T tm t of E lamps a A J Ob t 945 49
8

D g th f v c y ar p e r d fr m Ja uary 1938
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U v r s ty M d cal Center I d napol Th e
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of May d Ju Only 9 of th 31 p t nt had had
mo tha on p re v s delivery and 35 e e p e g
n t for the f t m E ghty four p e r c e t of th
pat nts e r under thirty ye rs of age

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k l u t o n i n a l l b u t i n s t e t h e l t a l h e a r t
b t p r e s e n t m t u r s a f t d m n I r
t u t a s t a n m p o t a n t f c t r i t h s g r u p
f f t d a t h a n d t h e y c a b e l o o k e d u p w t h
u t d i t n a l x e p t o a s d e t t h e t e m i a

The drug is well tolerated by the infant's eye. Occasionally a mild transitory flushing of the conjunctiva is observed. DANIEL G. MORLEY, M.D.

MISCELLANEOUS

Ba t n M. W l k e r K. and W i n B. P. Arti f i c i a l I n s e m i n a t i o n. B. I. M. J. 945 4

The authors give an excellent resume of artificial insemination in sterility problems. In cases of male impotence, dyspareunia, ejaculatory failure, and defective cervical viscosity, artificial insemination with the husband's semen is possible. The technique of self-insemination by the wife is described. A disadvantage when the first three of the conditions is present.

Artificial insemination does not diminish the cause of sterility in the couple.

The procedure of artificial insemination with the husband's semen is described. The problems of choice of cycle day, suitability of method of collection, installation, election of semen donors, and the organization of artificial insemination with donated semen are discussed.

The following potent dangers of artificial insemination are mentioned: uterine infection, and dysgenesis, cryptospermia, and germinal mutation. H. A. Y. FRIDMAN, M.D.

O'Sullivan J. V. and Bon L. B. Employment of the Papanicolaou W. M. B. I. M. J. 945 85

The authors followed up 30 patients for a long as five to ten months after delivery. Many of the conditions followed by the fact that the changes in the cervix are due to

Very few of these mothers thought that the delivery of the child was the end of the matter. The authors found that the delivery of the child was the end of the matter.

In cases of fetal death or financial stress, the mother is recommended and encouraged to turn to work.

The authors concluded that normal working mothers should not consider returning to work until six months after delivery. HARRIS, FIELDS, M.D.

M. Donough J. F. Vaginal Bleeding from Potassium Permanganate Used as an Abortifacient. V. E. G. and J. M. 945 3 89

Sixty-five cases of vaginal bleeding resulting from the use of potassium permanganate as an abortifacient were reported from the Boston City Hospital. In all cases the admitting diagnosis was threatened abortion, but the patient gave an accurate history. Upon further questioning, all patients admitted to the use of potassium permanganate as an abortifacient. Only one was successful in producing an abortion.

The ages varied from eighteen to thirty-eight years. Fifty-three patients were multiparas, 35 of them having been delivered of living babies during the past year. The majority of women had mild or moderate monthly periods.

The chief symptom was vaginal bleeding within two hours after the insertion of the tablet. Twelve cases required treatment to stop the bleeding. In the majority of cases, the operation required was a simple curettage of the vagina and cervix.

The typical picture of a peculiar manifestation of vaginal bleeding was described by a black woman who found in the postpartum period a vaginal bleeding both the cervix and the vaginal mucosa. The cervix also appeared to be severely irritated or to present a carcinoma in situ. The bleeding was relieved by the use of a bright dipulverin.

Because of the gradually increasing frequency of this new type of bleeding, it is a different diagnosis of cases of aglycemia in the child. The average age of diagnosis is many years after the birth of the child. The authors suggest that the diagnosis is a teratoma of the vagina.

C. I. B. H. M.D.



Fig. 1. The lateral view of the leg and foot. The leg is extended, and the foot is flat on the ground.



Fig. 2. The medial view of the leg and foot. The leg is extended, and the foot is flat on the ground.

When the lower limb is flexed, the foot is in a position of pronation. The foot is turned inward, and the weight of the body is borne by the inner side of the foot. This position is maintained during the entire gait cycle.

On the other hand, when the lower limb is extended, the foot is in a position of supination. The foot is turned outward, and the weight of the body is borne by the outer side of the foot. This position is maintained during the entire gait cycle.

The lateral view of the leg and foot shows the relationship between the leg and the foot. The leg is extended, and the foot is flat on the ground. The image is somewhat grainy and has a high-contrast, almost silhouette-like quality.

attacks last from a day to a fortnight. The pain is usually brought on by exercise. At rest, the bony point can usually be lifted easily out of its bed. The chest is approached from the point in the axilla as revealed by the lateral roentgenogram and may be there.

When the patient is in the supine position, the same lesion which has been observed in the lateral projection of the elbow is seen according to the degree of separation of the humeral head from the glenoid fossa. The bone which is displaced is seen in normal position. It is located in the articular part of the supratrochlear septum. The lateral projection demonstrates the thickness of the scapula and confirms its position. When separation takes place, part of the humeral head is displaced into the axilla. This may occur either forward to the coracoclavicular space or backward to the coracoclavicular space.

In addition to the above six cases, six cases have been reported in the literature, which are of the following nature: (1) traumatic; (2) congenital; (3) neoplastic; (4) infectious; (5) degenerative; (6) idiopathic.

These six reported cases of humeral head dislocation are associated with a loose body and a associated ligamentous case of traumatic dislocation. In five of the above cases, which came to operation, the histological findings were that of a synovial cyst. There is nothing to indicate that the condition is a cyst, but a sequestrated glenoid synovial septum with the evidence of bone.

may result the patient has to be protected from further injury
it may cause epiphyseal arrest and malignancy may
develop in cystic lesion which have been treated by
heavy irradiation D. H. L. M. M. D.

SURGERY OF THE BONES JOINTS MUSCLES TENDONS ETC

W. B. T. G. V. T. M. N. T. I. T. N. S. In Finger
Amputations and Description of a New In-
strument S. G. Y. 945 7

Disposition of the tendons in finger amputations is a matter which the surgeon must satisfy of.
In the techniques of most published works
of operative surgery recommends the removal of the
tendons to the tenon sheath rather than to the
in order to preserve the great stiffness of the
fingers.

Kirk advocates the following procedure for metacarpophalangeal disarticulation.

The finger is hyperextended and the tendons
are then allowed to retract into the sheath. The
finger is flexed the distal end cut and the
small sharp bladed knife the joint is opened the
capsular ligament cut and the finger re-
moved.

This hyperextension of the finger which allows
the tendons to retract into the sheath gives a
very useful handle. After the removal of the
distal end to the sheath the position of the
tendon or the wrist suture of the flexor to the
tenon rather than the metacarpal stump position.

duces an unusual type of disability with loss of the
grasp and inability to flex the fingers into a tight fist.

The mechanism of this disability is interesting and
is related to the common origin of the flexors par-
ticularly the profundus group so that tension on
any one tendon restricts partially the excursion of
the others. This is best demonstrated in the normal
hand by holding one middle finger straight in a line
with the metacarpals then trying to close the other
fingers into a tight fist. The fingers cannot be en-
tirely closed and there is pain in the forearm and
hand as this is attempted.

It is rather practicable to allow the tendons to retract
within the sheath so that they are densely adherent as
in a mild injury both the profundus and superficialis
should be stripped out to allow free motion. Control
of the proximal phalanx is exercised through the
digital tensor complex. Essentially this tensor
complex composed of the lateral and interosseous
as a flexor of the proximal phalanx when it passes
the lateral ward beyond the middle of the flexor is of
the metacarpophalangeal joint. The interos-
seous which carry the great load; the motions are very
strong and give an excellent grip.

Disarticulations at the distal interphalangeal
joint amputations in the middle phalanx are best
treated by dividing the flexor profundus tendon
allowing it to retract.

Amputations in the terminal phalanx are rarely
of the distal division for if they are distal to the
tendon insertion the hutchinson base of the ter-
minal phalanx the tendinous attachment is lost.

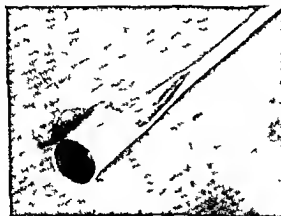
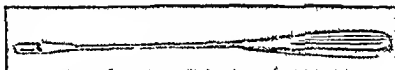


Fig. 1. The thumb is held in the palm when the finger is
extended as in the figure. The tendon is
then cut at the point of the figure.

tact R attachm nt f th e lff p f d
ti h lib c id t f uli b c
cu ed

Etisart d l nt t ct pr bly d
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b e and fu ct q te ell ff rse th re
s probl m f ny t j h th la the th mb
t dons should bep d d uture l t th bone
v th t s a ly no m la p ss ble

In ont m t d or fected ses th tendon
e ds should be a ch r i at th point of amputation
a d th te d n h th l f p n to avoid spr ad f
infect on to th h nd Such tendons may b come
adh nt a d p duce d s ability They sh uld be
e d to f th fing r th t cm des f the
hand being r l d upon fo mot on of the t mp A
t nd n stripper suitable fo f eei g such t ndo s i
th h nd de c b d

The rem l f d s ly adherent tendo f om
t carr d bed uld r q t sive c ions
th h nd if ne sought ad q t e p s e of its
e tre length E c s on tho gh small tra s erse
i s in the h d a d rst ca h cared out
e ly w th smooth t nd ns wh ch st p a ly from
n rmal su nd g ti s A adh t t don
mut b freed d a r ng l k t pper ha b en de
s gn d th a lo th n hand t d ssect uch adhe
s s and free th t d n n mu h the s m ma ner
a Mas on f asc a trpper s d to r mo long
st p f fasc l a th o gh a m l l n n e the
th gh The t nd can th n b ered th gh a
s cond small tr rse c n the w ist

The stripper d s bed h fo e c i n f i n
do n an amp tat on stump s sited ov the s
ered d of th tendo a d gu d d th gh the
p l m on the t nd n In this m cha c slpp g
f the c tting dg du g met mes v g ou d i
s n f th adhes s ca ot o cur nd i j ry t m
p tant nerve nd e sel n the palm st h p
nt d R r P Mo roome v MD

And n R Con ntric Arth od is f th Ankle
J nt A Tran nt Heola Appr ox h J B
S g 945 8 37

S r o s inf ct flail j t a d t aumat arth
rt may r q perat s f fu n of th a kle
j t Th ds bl g ympto s of fra m t c th
r t s can b e ad cat d by cc fl f n Th
c der ble d fficulty in su l g the kl j m t
th gh the t r pp b d i g su cal r
s o t n f th cat lag f the t c j t t b tan
th d j ed deg f q us f m s to d g es
a d l ght lg Un at f ctory immobl ton
ply an mp rta t l m po s lts

Th t an mall l app b s comm nd d hy
m ns f bl tral ppro ch t the l j t
aft ubperi t l r ect f th m l l The
next tep in th p ced e c ts res t n f
c t l g and s b h d a d b so th t the
res lt ca ll b r f c a co c t i
spe l c d t t me comm d d Th
j ermits ma mum c ta t betw en th t b d

tal Add t n l t b l ty ca b ga d by f
th d tal fl l t th t b Th m th d
l bl th t c t m nt of pp t th i
In the p t t e t h n i a l g t u n l e
mad o e the m d f m l l s h c h i es c t i
ubb t ally A l t l n c n m de th
t m f m l l of wh ch es c t d bp t lly
Th cat l e ds bch dral bone f th talus a d
t b a res cted A es c t n of a varu lg
def m ty can be made d g ths proced An
a th od s s of the adja ce t s r l of the t b a d
fib l s carr ed out The rema d of th b e f
b m l l eal r u ded O t g es m y b
t mul ted by rais l ttle bo e flaps a d by i g
b n e chips A St nm n pun is placed thr h th
d tal th app xim tely s sup r o r to th a kl
j nt Lock n ts r ttach d t ch d of th p
n d a t ppl d f m th t est b l th kn
W th th r the ca t castles t ch que a h d
g f m m bl at s suppl ed iat nt w th
omp d f act s may be crutch mbl t ry
C t l m m bl azon i btan d by g t
t fl p i thro gh the d l t b o eth ugh
th calcs d n th ugh the eck of th t l
Th f r p n c ected th f t n d d
th tal s is k pt n apposition t th t b a

RICHAR J BE ETY J MD

FRACTURES AND DISLOCATIONS

Se n k W F nd Pet r n W C Compo d
Fra ture O ccurring In th Army F t r s
In f cing T m nt Am J S g 94 67
333

Th ep esent a h creas d th d cuss f the
m thods of t eam t f comp nd fract es Art
cles wh ch seek t pply civil a exp nc to th
ca e f w r w d f t h inc mpl te de
stand ng of the fra t e p obl m th Army f
ode t po t t c t r a i n f c r s wh ch m d e th
t e t ment wh ch m y beg n i y u d s l d r th
uth s hav rev d th mp d f act e e
by th m n th d f f t st l t s Th c ses
bnely stated p sentat f the g o p f m a
placement tr m ng c ter Th results sh w only
wh t happe d nd d l c c m tan Th y
a of n a d i plan g th tr atme t f w r
w und The comp d f a t e ed amou
t m tra m g f r was of a d t tly d f f e th
at Abo t h l f f the f ct curred
d m l t d b t l l o d t n Bl t i n j nes
rang ng from c mpo d f t es f th f g r t
u d of th tm t enty curr d d g t
t mpt to imp f d m a d g n d f m
dyn mte M y f th pati ts turn d f r m
rs as Th m d p o d c d b e compl cat d
i n j nes Th it w s d m t n rves w tho t
jury t clos ly lat d ruct es Bl t
w ll sh ll fragm ts t t m s p duc d l r g
oul d fect th f t s d c a d y
m j pot f th bo e Th typ f ca f
e ns d rat on should be cl arly d nn d both a t

th c t t f j ry a d tl circumsta of its
c nce

Th j t t a e t t e l i accor l th j
c i f c i struct fr m th off c f the Surge n Gen
r l i h e s i n c l u d a l q u a t e e p u e i t h c a r t o
a v o l e r c i f t h s k i n a n f r e m l o f r h l y
a c c e s i b l e r e i g n b o l e s p r i c l e s o f b e s p a r a d
f r m t h p i t u m a n d e t a l e l t T i g h t
p a c k i n g f t h e o u d t o b a v i l e d F r a c t u r e s f
t h e f m l h a f t o c c a s i o n t h e m t d i f f i c u l t y
i n t r e a t m e n t A d e q u a t e i m m o b i l i z a t i o n f r t r a s p o r
t a t o d i f f i c u l t t o o b t a T h j t i s s h o w a
h i g h i n c i d e n c e f l m t i o n o f m t i f t h e j t s
c i c c l y o f k n e e f l e x i a d i s s f i g m o t i o n

The auth r s h a o t u s e d j n c i l l t h e p r i m a r y t r a n s m i t o f c o m p o d f t i n t h e i n t t a l s t g o f i f e c t o j t h i r e x p e c c e t h i s u s e i n c h r o c o s t o m y l i t u s h a t b g t

F m C P o i s h k M D

Annan J H S l l l s F a c t u e L t L o d
945 68 74

F m j i o n e r s f h o s p i t a l n G r m a n y
A n n a n r p t s c a s o f f r a c t u r e s p l a c m t o f
j a r t f t h j n u p r o c s s f n e o m o f t h e
6 t h j t h e c r i c a l o r t t h o a c i e v r t b r a T h
i t t h e e n t i r y p o r t d b y M k l l a r H l l m 940 a s
c l a y h o v l l r f a c t u

The t h e s o f a l l 8 c a s e s t r k g l y s m l a r
a l l b i g h a c t r z d b y o m j e m t s p i n n
t h p p e b a k a l h o u l l e r s W h i l e t a k i n g t h e
e i g h t o f a h l f s a l o s t h e l f t a r m t h e
p i t i f l t a p f o l l o d b y i m m d a t d h i l t y
r a y e x a m i t o f l t h e j t t e c a l e d
f c t u e s f t h 6 t l n d 7 t h c e c a l p i j e s e s

These p t t s c a p t d G a l e C r t
t h e p r g f 94 n l t u a l l y c e t r a f d t o
G e r m a y A b t a m t h a s p e n t t i t
c a m p n S l i k h r t h e r f o o d v a b e l t h i r
c e u t m d t i d l d C e r m a y t h e f o o d
t n w a s a t m a t c e l e l v h l l o t r
t t h e r g l e c d u n T h r l a c k l
b a n u t r i l l e c t r s i n t h e d t T h
p o b b l y p r d j o s g f c t t t h f a c t e s
d e s c b e d S h l l g s n i b t l t h t i g
c a e n d j d e d w h i t t p g p o
t h e n t h l g a m t u m n u c h e s t a t t h t i n
f t h l i f t i n f r e i t t h e i f t r m d h l l e r
i t h d i r e c t a t i n o t h e 6 t h n l 7 t h p e s t h r g h
t h m c l e f h h t h e f e c u l t l i n t
t h l g m e t

T e m t t f t h e s c a s e s g t h h t a d
t F a t l l l g c e u r s b y
f l r u u B j u G l w M D

W g l R l d R l l g l U n n i t d F r a c t u r e o f t h C a r p i S c a p h l d P r l i m i n r y R p o t n t l U s e f V i t l i m R p l i c a R e p l c e m t n t r f c i n t m j s g 945 67 84

Th b l l j p l y t t h e c a r y f t h l s h
t h t t f r c i s p l l f q t l i d s

p o e s t o p o s t t r a u m a t c e e r b t e c h a n g e s d e
l a y e d n o n a n l n o n u n i n a f t e r f r e t u r e N i
u n i n n u s t b d f l e n t a t e l f r o m b i p a r t t e s c a p h o l
L o r s i n d i a n s j c o m p l e t r e d u c t i o n a n d i n
a d q u t e o r i n s u f f i c e t l y p r o l o n g e d i m m b l a t i o n
a r e t h e m o s t c o m m o n c a u s e s l o n u n i n M a n y
c e s o f n o n u n s h o l t t l e i f a y i m p a i r m e n t o f
f u c t i o n

The methods f t r e a t m e n t o f u n u n i t e d f r a c t u r e s
o f t h c a r p a l s c a p h d a r

1 P r o l o n g t l i m m b l a t i o n
M u l t i p l d l l n g f t h e f r a g m e n t s

3 B o n e p e g g o g r a f t i n g o r r a t i o s
4 E x c o n o f o n e o r b o t h f r a g m e n t s o r e v e n
c e s n o f t h e c n t p r o x i m a l r o o f c a r p a l b o s

5 F u s i o n f t h e s c a p h o i d t h t h e c a p t a t e a d
l u n a t e

6 A r t h r o d e s i s o f t h e w r i s t

The authors a c k n o l e d g e t h a t a d r i l l g a n d p e g
g g o r g r a f t i n g p e a t i n i s m o r e l i k e l y t o b e s u c
c e s s f l i n c a r e f l l y s e l e c t e d c a s e h e n t i s d o n e b y
a n e p e n e e d a d s k i l l d s u r g o B r i s t o w i
q u o t e d s t a t i n g M a n y e x p e i e n c e d u r g e o s a r e
r a p d l y c m i n t t h c o n c l u s i o n t h a t t h i s o p e r a t i o n
h a s n p l a c e i n t h e t r a t m e n t o f a s l d i e r B o h l e r
t q u e d a s s t a t i n g t h a t h e h a l e v e r s e n a c a s e i n
w h i c h t h e u s e f l e s s f t h e h a n d r e t u r n e d t n o r m a l
a f t r r m o v a l o f t h s c a p h o i l b o n e C r a e n e r a n d
M e l o y b e l i e v t h a t i f a d e g e n e r a t i v e t y p e f
a r t h i t s h a s a l e a d y s t i n o b n g r a f t i n g o r d r i l l
i g w l l r e s t o r e t h e w i s t t n o r m a l a d f o r a n c i e t
u n u t d f r a c t u r s w i t h a d g e n e r a t e a r t h i t s o n l y
r e m a i n f t h p r o x i m a l f r a g m e n t s i l l p e m i t a
c u l t u r s c h a d c a t d e a r l y e x t r a p o n f t h e
b o n e b f o r e t r a u m a t c a r t h i t s d e v e l p e d i n t h e
u r o n l g b o h h a d e x c e l l e n t r e s u l t s i n 9
c a s e s S e e r a l d i e r n t j o n s a r q u o t e d

The a t h r s c l u d t h a t m u l t i p l e d r i l l i n g a n d
b e p g g i g o r g f t g o p a t i s a e n t s u i t a b l
f t h m r c m p l c a t e l c a s e s o f f a c t u r e o r n o n
u n o n l t h e l a t t e r g u t h e y c l u d

1 t h i f r a c t u r e w t h t h e f r a g m e n t s b a l l y c o m
m u t d a n d j l a c e d p a r t i c u l a r l y t h e n v o l v i n g
t h e p o x i m p o r t n

2 O l d c a s o f p u d a t h r o s i s t h t h e f r a c t u r e
t h u g h t h e a s t p o x m a l p o r t i o a n d a s s
c i a t d t h l c a l d e f r m n g a r t h r i t

3 R i n j r y c s e i v h c h d n c a l s y m p t o m s a n d
l a b i l i t y s i t a l t e r a n a d e q u a t e p e r o d o f i m m
b l a t i n

The h o i c e f t r a t m t i t h e c o m p l e c t e d c a s e s
e s t s b e t w n c o n a l t h o d e s T h e a u t h r s
f a v c i s o a d r p l c m e t f t h e c a r p a l s c a
p b l t h a p r o s t h e s T h y h a e v e d a v i t a l i u m
p l c a n 3 c a s

T h p e r t e t c h q e s d e s c b e d a s f l l o s
W t h t u r n u g t a n d t h h a n d i f u l l a d d u c t o n
a u r v e d i c n m a d e w t h r a d i a l a s p e c t o f
t h s t T h r a l i a l r v a d e s l n l t h
a b d u c t r t d f t h t h u n b a e c t r a c t e d a t e
l y a n l t h e e x t e s o p o l l i s l g u t d i
r e t r a c t d j t r e l y T h e c a p u l i p n e l t r a

v r s ly The fragme ts of th n united scapho d are
 rem v d a d a mbl d in o der to judge the s ze
 d shape of th epl ca The repl ca is s t d
 the pr per p s t The w nd is cl d d
 mold d pl st ca t is ppl d to cl d th th mh
 hand and distal tw th ds of the fo e m with the
 w t dors fle ed 3 degrees The cast is w m for
 two weeks a d th n a leathe gau tlet replaces it
 th s remo ed fr phys cal th rny

DANIE H LEVYN B. M.D.

ORTHOPEDICS IN GENERAL

Olm s y S Critical Study fth Kenny Method in
the T eatm nt f Poll my liti Ph y p tho
logical Principl in the Choi f a t chniqu
f r the T eatm nt f Inf ntil Paraly during
the A ut P nod (Et d nu d l m t d e
K y l tramat d l pol m hts Fund
m t fisu p t lgc p l lec d l t crica
l tramat d l p rali s f t l d r a t l
p nod gud) C s p t m t 944 06

The author discusses in considerable detail Sister Kenny's technique in the treatment of infantile polio, is agreeing with her in the merits and differing in others. She states that the patient's mental alertness must be preserved, and that hydrotherapy and physical exercises should avoid the immobilizing method that have been customary.

The really st g p nt her meth d the
stenc on ea lypas a dacti m bilizat of
th muscles m scl e ducation san ld d th do
meth d of treatment She h lds that the f da
m ntal symptoms of the d ea a m scl p sm
muscle inc -o d ati n a d m tal ale tio
While it i tru th t these a e symptoms f th d
eas th s th ry l a es o t f acc unt th f nda
m ntal path l gy h h thes sympt m are
l s d

A Spanish Sanz-Iñáñez first discovered that the es nti lleso s Th i j es of the r s d f the moto plaques Th i j ry of the eur ns results n face d paralys s which limits the pos b l t es fcur by any meth d f t t me t The neu on may be cut off f m s c nn tions with the central nerv t act whl those with th p ph l tr ct em in intact th case th cr as d t f th m des s ppl ed by th p pheral t ct B t f th on is cut f f m ts ect s w th both th c tal d p ph al t es face d paralys s results Le ns f th and tracts may occur i j r ying d grees both qu l tatively a d q t tat ly Som times nly th moto pl q es a i j d d in these cases v ry ten i c nd s pa alyses m y d app ar qu ckly and lmost c mpletely

R - ed cat on of the m l s t so d ff lt
 ch l d e who ha e ch d th ag of e but i
 childr less th n w y ars of ag it is ry d fficult
 as th y ca not u d rsta d eq ests made f th m
 a d will ot em n n the m p t on Th he t
 appli d n the K y meth d a d y h at not a
 mo t h at d the a th r add co ta t th rmo-
 th py with l ght h ths h ch enf esth to
 In cases of spasm of th delt ds wh ch is ra e h
 does t h l e th t the rm sh ld h kept
 t d d t the des as in th K nny meth d h t
 th t they sho ld h pl c d at ight angl to th
 b d y with the lh w s f e d d th wrts t d d
 Th plac ng f the s les f th feet ag unst th
 rural bo ds th Ken y meth d post r l
 t atm t des gn d to pev t th de l pm t f
 pes qui us P stu l tr tm t h s l g b n
 d cat d in th d se

Frequently affected time of the day is
a careful clinical histological description
of the disease should be made for early cases with
the following features: prodromal stage, the
pathological findings of Sanz Ibañeta hold the key
to the diagnosis. ADRE G M C MD

AUDRE G M c M D

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

11 n s n C J Varic s of th Es ph gu in Chll
den A t d l St kh 944 5 5 7

In ca es of hemorrhage from th alimentary canal
it imp rta t that the poss bl pre e ce f l ge
ment of th spleen and vaicos veins in the soph
g s be v st gated Ths led s t pph t
a lults only it is equally es tial in chldr n

Var ces ca arie i th es ph g as es it of a
thrombosi in the vena lical Thelatte c d to
produ es e cess f blood the e i c e
q ence of hich the pleen b c me enl g d ls is
ell kn th sple r c es ts blood f m one
large a tery a d the bl d i d ain d to the portal
in through the ena lical only Th sple has
feve l l tral i a d th e h ch u ha run
th o gh the ph e c ple ie an l ga tr l al l g
ments Th v in situat d i th frt m t i ned
l gme t t r m te n a e sple u in th r g
f the lowe e d of the e oph g an l the s in
the p e ene of a thromb s f the plemic cin
become gr atly d st nd d d g i e r e to varie s i
th s segme t f the alimentary canal

Stas s the ena licals r th pot l v tem i
m ked by th e ma nsympt m i enla gem t
f the pleen asct s d the vomit g f blood
Mte ala g qua t ty f blood has b m tel
the hypertrophy f th spl en is abse t as the blood has
bee empt d fr m the o ga d cites ca al be
al e t at that tme Of th th e ma nsympt m
o ly the h m r h g mai l th ca se fite n
be d e v r d m t e ily a d eff cti ly by m a s
of a r e t g e m tion

Seve h m h g e du t e ophage l ar ces n
chlle are me t i c l s the p d t i c l t r a t r
The uthor r p t n d d t nal g ca es

The orig i f the compl int s often be c
Var type of fecti nar ig f e tet l gical
f c t r l n f th it ca s the past h i to y
c t i ed ment f mbilical infect

Th th r concludes that ca e of u cco nt
bl h mo h g s in hid en roentg ogram of th
esophagu h l l al ays b t ken Th p t u e s
h t r t u f l l i g d f c t i the ophagus

Jos h N M D

Lint n R R nd White P D A t r i n u
l l t u l between the Right Comm n III
Art ry d the l f r i v Cava R po t o f a
Case of It Occurrs f l l wing an Operati n
f a Ruptured l t rvert l rat Di with Cure
by Operati n A h S g 945 5 6

Th purpo f th s art l i s t p e s t cas f
art n s t u l a b e n th g h t c mmo l a
a t r v a l th f n a c a f l l g n o p e r
t f r u p t r e d t r v t e b r a l d i c l J r y t
th blood essels w s t r e c g n i e d t th t m e l

th p r t i o i the d s c and the diagn s s f the
fistula was not made until eight months later i he
the p t i e n t compl ned of increa ng dyspnea o
e ert

This case demonstrates a number f interesting
po t It re e l that surgical removal of a rup
tured i tervertebral d s c is not without danger to the
gre t vessels which e on the anterior surface of the
bod es f the lumba vertebrae and it d monstrates
th t the c m m l a c a tery can be int rrupted
th t endanger the v ability of the limb Ana
tomic st dy of th s egion sho s that the inferior
ve a cava is formed by the union of the two common
iliacve s to the ight of the median plane in front of
the body of the fifth lumbar vertebra a d behind the
ght c mmon iliac artery The latter crosses the
d stal nd of the v cava opposit the fourth inter
v rterbral d s c from right to left a d bec use of the
great turgid ty of the artery th vena cava is fixed
t a certain e tent ag st the vertebr l column As a
result of this anatomic arr ngement f the right
c mmon ilac artery the inferior vena cava and the
fo th intervertebr l spac a sharp eu t or instru
ment such as is used for rem al f a ruptured inter
rt bral d s c may t ansf the artery a l vein if it
suddenlv f r e d thr gb the ant nor l g t u d i n a l
ert bral l gament Although the surg on did not
rec gni e that h s instrument had injured these
els n this patient there seems littl doubt that
the fist la wa prod d i this man r According
to M ter Talmadg a d Walke sim l t i o n s
have bee prod ced by other surgeo s whle they
w p r f o r m g operations for ruptu ed interve te
b a l d e s

It appea s offh nd that such a vascular lesion
w uld res l t i ever unco trollable b morrhage
An naly is of the s t at on h ever reveals that
th blo d i h c escapes from the c mmon ilac ar
t r y w l l o l l w th path of last resist nce S e
the venous pressu e i the inferi ve a cava s ap
p o ximately e s c a p i n g a r t e i a l blood will natu
ally flo i to th large venou reservoi of the caval
ystem rather than t r a v a s a t e i to th p vertebral
paces against res ta ce f th tissues The e was
nd bt lly s me local e tra at on as evidenced
by th abnorm l fibrous t s s u aro nd the great ve
els fou d at operat o but it c uld not have been
massive in the abse ce of shock follow g the oper
tio The diagnos f arteriove ous t s tula as
m d i th case because of the beg n g ca diae
decomp sat th enla gment f the h r t with a
ch ract rist c type of pulsati on b s rved on fluo
cop ce am nati and the cont nu s thrill with
sy t l c a centuati n which was hea d i dest o r
th reg n i th lumbosacral artical tio The sit
of the fistula was localiz d p e r a t i v l y betwe n
the right comm n il c artery and th i f e r o v e a
ca b c a e th thrill and the brut w e t n

situation other than the lower extremity. The clinical diagnosis of phlebothrombosis is presented together with an extensive discussion on the prevention of venous thrombosis.

In this summary the authors state that in the last 200 cases dissected in the femoral and iliofemoral veins was carried out. Like others who have examined the femoral vein they find that phlebothrombosis of the lower extremities begins in the deep vessels of the calf and tends to propagate toward the heart and that thrombosis of the femoral vein alone is an uncommon occurrence. Both sets of veins are the most frequent sites of the distal embolism and for this reason they are the most important of all the possible sources of both fatal and nonfatal pulmonary emboli. There are no important differences between the two series concerning age, sex, or location of the thrombosed calf veins.

Thrombosis of the deep veins of the leg is a frequent entity in all classes of middle-aged individuals who have any reason what you must go to bed for longer than a few days. This is usually without prominent symptoms. Phlebitis as a cause or as a complication of deep extremity vein thrombosis is very uncommon in this series and is unimportant.

The local application of the principle of phlebotomy and plasmapheresis in the management of phlebitis and thrombosis has been emphasized. The diagnosis and treatment of deep vein thrombosis on prevention. Prophylaxis is based on simple and readily carried out physiological principles.

Education of physician and nurses with respect to the site and causes of thrombosis of the legs is urgently needed. The incidence of phlebotomy in a small series of medical patients proved to be significantly less than it was in the first 100 cases. It seems probable that the institution of active exercises of this group was responsible for this decrease.

HERBERT F. THOMPSON, M.D.

Dennel C. D. et al. Following Femoral Vein Ligation for Thrombophlebitis Relief by Falsely Diagnosed Case of Renal Impairment. N Engl J Med 1957; 256: 1045-1047.

The incidence of bleeding in patients undergoing a thrombectomy is high. When the deep veins are treated by ligation and removal of the thrombus, the high ligation of the vein above the thrombus is a desirable procedure. The authors report a case with high ligation of the femoral vein complicated by development of a false aneurysm. The patient died of a massive hemorrhage from the false aneurysm. The authors conclude that high ligation of the vein above the thrombus is a desirable procedure, but that it should be done with caution.

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At operation an incarcerated femoral hernia containing necrotic omentum was found. This was repaired and sulfathiazole was implanted in the wound. For three days postoperative the patient had a temperature as high as 101°F, but during the next ten days he was afebrile. Eight days after surgery he presented a positive Homan's sign on the left side with tenderness and local heat in the left calf. Symmetrical block with 100 percent procaine of the first second and third lumbar levels relieved the patient's pain. Twelve days after operation, welling tenderness and local infection appeared about the wound. Sulfathiazole (4 gm per day) was given orally and despite of this the temperature rose to 101.5°F three days later. The sulfonamide was then stopped as it was believed that the temperature elevation may have been due to the drug. In the next three days the wound healed and the temperature dropped to normal. On the twenty-first postoperative day swelling, tenderness, and a positive Homan's sign developed in the right lower leg, but this was not relieved by symptomatic block.

Two days later a firm thrombus could be palpated from the knee up to 12 cm below the inguinal ligament. The calf increased in diameter about 8.5 cm and was pinker, warmer than the left. It was decided to ligate the femoral vein above the symptoms. No operative and a local anesthetic as the safest course of treatment. After this was done the entire leg was engorged and deep blue and the patient complained of pain and numbness in the leg. The skin was quite tight and the dorsalis pedis pulse on the right was faint. In spite of a procaine sympathetic block, which gave only minimal improvement, the temperature of the right leg gradually fell. It was estimated that about 3 liters of fluid were lost into the thigh and four hours after operation the patient blood pressure fell to 40/10. Eleven hundred cubic centimeters of plasma and 500 cc of blood were needed to return the pressure to normal.

Six hours after operation there was a difference of 16 cm in the circumference of the thighs and less difference in other measurements. The leg became more blue and black, and the patient became edematous. The temperature fell. The patient eventually died. The deep fascia was dissected and the femoral vein was found to be ligated. The leg rapidly became warmer below the knee.

Three days after fasciotomy the patient developed chest pain, consolidation of the left lung, and a chill. The ray showed a left infarct and the temperature dropped and penicillin therapy.

Eight days later the patient became anemic and hematemesis and it was feared that a mesenteric thrombosis might be complicated by the patient. The vomit contained blood for a week while the patient was critically ill. Two weeks after fasciotomy the wounds were clean and granulating. Motor power was lost below the knee. He sat on the thigh pressure was unimpaired.

Two days later he developed edema of the thrombophlebitis in the left lower leg. A ray of the apy was

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HE R F THURSTON M D

elevated until consciousness occurs to avoid any possibility of asphyxiation at the trachea.

Since 194 this method has been used in 80 cases. The attitude of the authors is favorable and the technique is being used increasingly.

The success of this technique is dependent upon the extensive and adequate topical anesthesia of the pharynx, glottis and upper trachea.

M y KAE M D

Warning: L c t L d 945 48 r 5

Of 10 cases of *Pseudomonas pyocyanea* infection following spinal injury, 5 are recorded. The cases occurred within three days of onset. An effort was made to determine the percentage of cases. Cultures were taken from the tap of the spinal canal and from pools of possible contamination. The results are as follows:

What is the social effect the moral is ob-
vously clear defined rules for the sterilization of the
apparatus of social life must be adhered to

Recommendations for the statistical analysis of syringes and needles by bolger were given in detail

MA Y KAR M D

Simp th n L E C n ul l ns during C n l Ancs

Conulsions may occur during treatment with chlormethine in the ethylene cyclopentane as well as other esters. There is confusion that the

the ph... c... f... v... s... s... d... h... o... t... b... u... m... d... e... n... t... r... n... l... s... o... d... g... s... m... t... b... e... n... i... m... p... o... r... t... a... n... t... t... l... o... g... i... c... a... l...

f ct Oth possible caus s are an a imp test
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Convulsions can appear at any time although the

importance of neurogenic stimulus is tested with the convulsant commencing at the moment the patient is grasped in the forceps or in the

The percentage of treatment is also

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st tuting the ntrav nous dmni strati n ol e ol
the barb turates, or of an exogenous sulfat

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pendectomy under nitrous oxide, and an abdominal

The blood pressure during most of the treatment was too high to be recorded. The treatment also brought about a cessation of the convulsions and the

MARY KARP M.D.

Cole F Th U e of Curar in Anæ the la A Re
view of 100 Cases *A esth s l gy* 945 6 48

One hundred and fifty eight intravenous injections of curare were given to obtain relaxation in 100 abdominal surgical procedures. Most of the patients were anesthetized with cyclopropane.

Cats obtained by brewing the various parts of several species of the strychnos genus. A 2 per cent solution is the drug used in this series. Activity of the drug is due almost entirely to the presence of a crystalline substance, di-tubocurarine chloride. The cure effect is due to the interruption of nerve impulses at the myoneural junction so that the muscle will respond neither to injected acetylcholine nor to stimulation of its nerve. The action is entirely peripheral and is inhibited by prostigmine.

Muscles are affected in the following order: first those supplied by the cranial nerves followed by those of the trunk and extremities and finally those of expiration. The diaphragm is the last muscle to be paralyzed. Recovery occurs in the reverse order. The incidence of laryngospasm is believed to be smaller when curare has been given. Endotracheal intubation may be facilitated by its use.

The use of curare with a light general anesthesia allows aesthesiologists to take advantage of the advantages of spinal anesthesia in that it eliminates some of the untoward signs and symptoms complicating subarachnoid cervicocaudal block, as well as the possibility of permanent damage to the spinal cord and spinal nerves themselves.

Two absolute contraindications for its use are myasthenia gravis and the inability of the anesthesiologist to perform artificial respiration. Another contraindication is the presence of impaired renal function because curare is partly destroyed by the liver and is partly eliminated unchanged by the kidney.

The patients' age, vigar weight and depth and rate of perfusion were considered in calculating the dose. Based on weight alone a dose of 1 mgm per kg body mass of 1 to $\frac{3}{4}$ mgm per pound of body weight was used.

All injections were intravenous and were made rapidly; no special administration requiring more than 5 seconds.

U des rable s de effects c ns ted ent ely of res
pirat ry depress ion. Mld depress on was seen in
4 cases. sev e depress ion without ctual apnea
occurred in 8 cases and apnea w s seen in 4 cases.
Art fic l resp rati n had to be titutted in 1 of the
roo cases. Caution is suggested against admin ter
ing cura e w th penthal ether or trbromethanol
becau e these drugs ha slight curari rm p oper
ties. Ether is th g st no eful

The youngest patient treated was three years and weighed 23 lb; the oldest was ninety-one years. The average dose was 73.7 mgm. The interval is between the first and second doses ranged from ten minutes to one hundred and seventy-five minutes; the average being seventy-four and eight-tenth minutes.

While pharmacological evidence suggests that the
excretion of curare is very rapid, minimal perime-

PHYSICO-CHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Carr H D S nd Cl gll P Roentgen Pathology
of the Chest In Battle Ca ualties Im J
R Ig 945 53

Due to the difficulty of the clinical examination in a severely wounded soldier and because of the multiplicity of pathological changes the aid of the roentgenologist becomes invaluable both in diagnosis and surgical judgment.

The lesions most frequently encountered by the author were rib fracture, multiple rib fractures, bilateral injury with hemorrhage into the lung parenchyma, pulmonary thromboembolism, aortic dissection, pharyngeal and esophageal perforations, and rupture of the abdominal aorta. The following case is given to illustrate the use of the roentgenologist in the diagnosis and surgical management of these lesions.

The case presented to the author was that of a 35-year-old male, a private in the United States Army, who was admitted to the hospital on May 15, 1945, with a diagnosis of "traumatic injury to the chest." The patient had been shot in the chest by a German soldier during the Battle of the Bulge. The patient was brought to the hospital by ambulance and was in a state of shock. The physical examination revealed a large, tender, and swollen area on the left side of the chest, with crepitation and hyperresonance. The roentgenogram of the chest showed a large, well-defined, air-filled cavity in the left lung, with a fluid level. The diagnosis was a large, air-filled cavity in the left lung, with a fluid level, consistent with a traumatic injury to the chest.

All of these are illustrated with the roentgenogram. The patient was operated on and the diagnosis was confirmed. The patient recovered and was discharged on June 1, 1945.

The following are the roentgenograms of the chest, showing the large, air-filled cavity in the left lung, with a fluid level. The patient was operated on and the diagnosis was confirmed. The patient recovered and was discharged on June 1, 1945.

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Pomeroy R Grady H G P In M and Mag
n M Spontaneous Cholecystoduodenal
Fistula In a Patient with Primary Spleenoma of
the Liver R d Ig 944 43 58

Spontaneous cholecystoduodenal fistula associated with primary hepatoma of the liver is exceedingly rare. Of special significance is the fact that diagnosis may be made preoperatively by means of roentgen studies.

A detailed case report of the surgical and autopsy findings is presented. Diagnosis was made by means of roentgenograms and fluoroscopic studies. Some barium was introduced into the stomach near the superior portion of the duodenum. The barium sum of the negative showed at four hours there was a 7 per cent retention of barium in the fundus of the stomach on the lateral view. The aspect of the retention of barium also showed the duodenal manometry of the previously described negative shadow. The bladder examination failed to show any evidence of a gallbladder shadow. Roentgen examination of the gallbladder test at the time that the barium was introduced into the gallbladder and diagnosis of cholecystoduodenal fistula was made in the cystic duct was made. The enlargement was noted clinically and on the film.

To determine the position of the biliary fistula, a barium meal was given. The patient was operated on and the diagnosis was confirmed. The patient recovered and was discharged on June 1, 1945.

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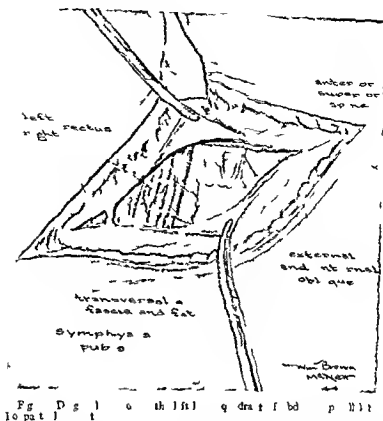
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to 5 years later the bowel was mobilized as far as the splenic flexure and anastomosed to the rectal stump. To avoid an artificial abdominal stoma Jerome Lynch (69) advocated amputation by the perineal route in which the bowel is divided at the level of the peritoneal floor with no attempt at approximation.

Independently under the title of abdomino-perineal sacral or anal excision Ber^o Pannett Arnold (6) Pratt Pack (80) Berweret and Ivory Wilensky and Wangenstein (98) describe their technique in one two or three stages with preservation of the sphincter musculature while Horsley Wood and Wilkie Babcock (9) Gallis Arnold and Shea (7) Wangenstein (98) Dixon Dunphy as well as Zininger and Hovnorth offer contribution to the literature in which the rectum, sigmoid and lower sigmoid are mobilized and resected with immediate re-establishment of continuity by open or aseptic end-to-end anastomosis.

By the foregoing it is obvious that remarkable progress has been made toward eliminating a colostomy either by preservation of the sphincter musculature or by reestablishment of continuity of the resected lower sigmoid, rectum or upper rectum.

Why should a colostomy be avoided? A logical question. How many times after stating that an artificial opening on the abdomen is imperative have we heard patient say:

Doctor I would rather die than have a colostomy. One is prone to wonder how many patient have died needlessly by refusing such an operation when radical surgery by other means was not made available to them. Surely many and too many could have been effected. Too often colonized patients are socially ostracized, a train of psychoneurotic manifestations may be suffered even to the point of suicide, marriage may be interrupted and many are unfit for employment and thereby refused a means of livelihood.

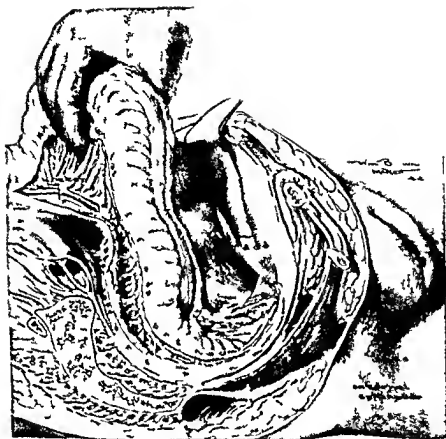
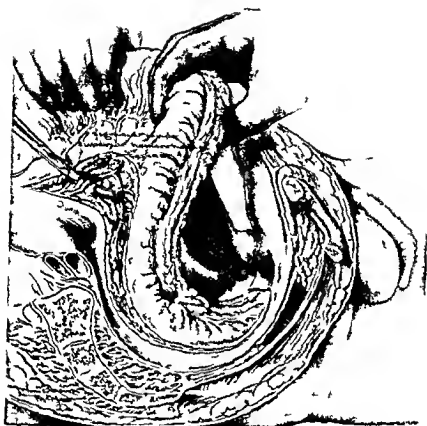


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hood Babcock and the writer have many case histories in their respective files which serve to substantiate this. To date he and I have transplanted the colostomy to the perineum or anastomosed the colon to the rectal stoma with or without resection in 57 instances with but 1 death—mortality 1.9 per cent.

In this group were two physicians and one dentist who were handicapped in the performance of their daily tasks. Several domesticities were compelled to seek positions elsewhere. A child developed a marked inferiority complex because her classmates teased concerning her abdominal opening. A woman was unable to hold her position in a bank, an assistant superintendent of a large Philadelphia hospital after 2 years of service was about to be relieved of his position until transfer of the colostomy was effected, an evangelist was unable to carry out his duties and in 3 marriage was postponed until transference of the colostomy was made. These patients attest that they are more pleased that the discharge of offensive gas is less evident than the perineal opening is more convenient and easier to care for and that the evacuations are more satisfactory and less frequent. Should not the opinions of persons afflicted with this dreaded disease who have been subjected to a colostomy life and now possess a perineal anus (anal sigmoidotomy) serve as an index as to its efficacy? As Horsley said a few years ago "Something more than mere existence should be included in the objectives of surgery if the patient can be made more comfortable and life made to seem more worth living after a procedure that offers about equal chance of cure of the cancer as other operation it is obvious that this technique should be a logic." 1

The main objective in the treatment of cancer is of course complete eradication of the disease. Even though a colostomy is contraindicated by many sacrosanct intestinal and duct preservation of the sphincter musculature omits the radicality of the operation. It has become apparent that the view of Miles (4) as to the lateral anal peculiarly the inferior zone of perineal neoplasia is a limitation. The following patho-

logic-anatomic study by Westhues in 1934 showed that cancerous connective tissue and lymph node metastases are situated at the level of the carcinoma or above it. Gabriel Dukes and Bussey (42) concurred in these findings and remarked "Lateral or downward lymphatic spread is only found in a late stage of the disease when the hemorrhoidal lymphatics are blocked by metastases." Collier found no evidence of retrograde metastasis to nodes situated 3 centimeters below the primary site although Gilchrist and David (45, 46) noted 4 such instances. Collier further observed no metastases along the lateral zone of spread where the inferior border of the lesion was 3 centimeters or more above the mucocutaneous junction (anorectal line). It may be assumed therefore that the inferior zone of spread is relatively unimportant whereupon the sphincter musculature may be preserved provided the lower border of the growth is 3 centimeters or more above the anorectal line (6 centimeters above the anal margin). Based on an experience of over 1000 operations Lynch (70) in referring to the work of Dukes remarks:

It permits one to discard entirely such radical and unnecessary operations as that popularized by Miles.

It seems appropriate to inquire: If the sphincters may be preserved in all cancers situated above the six centimeter level in what proportion of cases do these occur? A few years ago the author (12, 13) reviewed a series of 1993 cases of malignancy involving the anus, rectum and sigmoid colon in which the distribution was accurately noted in 1401 instances as shown in Figure 1.

It is evident that only 10.2 per cent of lesions (4.9 and 5.3) occur within the distal 5.5 centimeters of the bowel (above the anal margin) and 19.1 per cent (4.9, 5.3 and 8.9) within the distal 8 centimeters. It may be deduced therefrom that at least 80.9 per cent of cancer or those above this level may be removed without sacrifice of the sphincter muscles. Mandl (71) in 1922 observed that of 461 operations for cancer of the rectum the sphincters were preserved in 27 cases. He concluded: "Wherever possible in situations where the tumor is at a sufficient distance from the sphincters these should be pre-

TABLE I—RESECTED WITH COLOSTOMY

N m		N	Resect-	f	S r v	
		case	b1	l	er	is
		sec				
H y d	d S h d l (5)	65		3		5 m
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M l es	(7)	3	5			
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H y d e	()	3	766			m
Pf f	(8)	6	5	5		m re
Ca ll	()					

served. In my own series of 65 radical resections the sphincters were preserved or continuity immediately established in 167 cases or 80.3 per cent.

Does preservation of the sphincter musculature augment the operative mortality? Mandl (72) is quite definite that it does not. In a combined series of 414 radical resections for cancer Babcock (10) and the writer reported a mortality rate of 6.6 per cent for 22 cases of abdominoperineal proctocolectomy with out colostomy and 4 per cent for perineal proctectomy without colostomy. Immediate establishment of intestinal continuity for upper rectal, rectosigmoidal and low sigmoidal growths has but recently become popular and while the mortality rate is slightly higher it may be assumed that with added experience the rate will be decreased. It will be noted that except for the group reported by Dixon namely 266 cases the series are not large. Zimlinger and Hoxworth who prefer this method cite 15 sigmoidal resections with death—an operative mortality of 11 per cent. Babcock performed 16 single clamp aseptic oncologic resection with death or

9.2 per cent. Excluding those in which operation was done as a palliative procedure the mortality is 4.3 per cent. Wangenstein (98) reports 8 cases and Horsley 3 cases without a death. Over a 12 year period Dixon reports a mortality rate of 12.1 per cent and 3 per cent respectively for those with a view of cure and those as a palliative procedure. Of 41 cases recently performed his mortality rate was 2.4 per cent. Fallis published a series of 31 cases with a mortality rate of 6.5 per cent. During the past year we have employed immediate end to end anastomosis in 16 instances 1 with a view of cure and 4 as a palliative procedure. My first patients died due I feel to too much reliance upon indwelling duodenal siphonage. Since that time complementary decompression—usually appendicostomy—has been employed without death. The mortality rate for the 16 cases however is 12.5 per cent. A distinct advantage of reestablishment of bowel continuity in the pelvis is the avoidance of impotence so common in abdominoperineal extirpations. Jones (58) found the incidence to be 9.5 per cent.

It is difficult to compare the survival rate of an operative technique in which the sphincters are preserved with those in which the muscle are sacrificed because of the relative infrequency of performance and sparsity of reports of the former. In citing the experience of various surgeons as to cure the percentage of operability (rectability) should be considered as well as the mortality. Attention is called to the fact that for the most part the following reports were published a few years ago. It is only fair to assume that if more recent data were available the resectability and survival rates would be increased and the mortality decreased.

I have surveyed the results achieved by several European surgeons including Eiselsberg of Vienna, Payr of Leipzig, Sauerbrook of Munich, Guedel of Jena and Kirchner of Tübingen. The average end year cure of tumors were 9 per cent and 3 per cent respectively.

In contrast are a few reports where the sphincter muscle was not sacrificed. For example Mandl (7) states that preser-

vation of the sphincters does not influence the lasting results adversely. Based on a series of over 1000 operations, the percentage of 3 year cures was higher in cases in which the sphincter apparatus was preserved (33 to 37%) than when sacrificed (25 to 31%). He maintains that similar results were obtained by Eichhoff (Kuettners clinic) and Irbarm (Layr clinic). Our combined group of cases is shown in Tables I and II.

What degree of continence has been experienced following various procedures to preserve the sphincter muscle? Mandl (71) an ardent advocate of the Hochenegg method reported that of the cases in which circular suture was performed 19.3 per cent of the patients were discharged as continent complete control was effected after a period of time in 49.4 per cent. Following the pull through method the number of continent patients increased from 58.3 per cent to 64.5 per cent. In contrast however is the publication by Koerbel of the Eiselsberg Clinic who observed complete continence in 36 per cent employing Hochenegg technique and 66 per cent with the Kraske method. Gersuny recorded satisfactory continence in 75 per cent of his cases. Du Lan a pupil of Kocher reported that 8 patients had complete and 32 partial control, 11 were completely incontinent. In a discussion of continence one should be mindful that preservation of the sphincter musculature is not necessarily synonymous with preservation of the sphincter function. During the perineal portion of the operation proctostomoidectomy even though the external sphincter preserved its innervation namely the inferior hemorrhoidal and perineal nerve derived from the second, third and fourth sacral plexuses are innervated intact along the main filament from the fifth sacral and coccygeal plexus—the lesser pudic nerve of McKittrick following operation and in many cases within a few days voluntary contraction can be observed objectively and subjectively. One recalls the experiment of Elliott who found that the external sphincter even when separated from its nerve supply was not prone to degenerate as is characteristic of other voluntary muscles. That it retain the responsiveness to the fra-

TABLE II—RESECTED—NOT COLOSTOMIZED

Name	Sex	Residence	Age	Srvs received	
				Yr	Mo
B. Brock	dB	()	03	66	85

Add on pre-lproc on mondecim
 P ronal neg on m. decim

66

current is shown at the time of sphincteroplasty usually 10 days after proctosigmoidectomy. In some 160 cases sphincteroplasty has been performed by means of a faradic stimulator especially designed by George C. Henny, M.D., director of Research Physics at the Temple University Medical School. As will be described under technique the sphincter musculature is divided posteriorly; it is dissected free and retracted anteriorly and laterally. Preservation of the three tracts of muscle bundles composing the external sphincter offers little difficulty except that it is a tedious task. Approximation of all divided musculature is effected at the time of operation except the posterior quadrant of muscle because of the necessity of presacral drainage. Our great problem lies with the internal sphincter which in itself is a most important structure. Designed to aid in the expulsion of feces it also assists to occlude the anal aperture by tonic contraction. This muscle representing an aggregate of inner circular muscle fibers of the rectum into a single component measuring 2 to 3 millimeters in thickness and 1 to 3 centimeters in width (49) and innervated primarily by the sympathetic and parasympathetic nerves maintains perfection in control especially of flatus and liquid feces. With this operation efforts to preserve this involuntary muscle have not been too pleasing. By the same token while we feel that the somatic or cerebrospinal innervation to the external sphincter is but minimally impaired the visceral innervation to the internal sphincter is definitely interrupted. The investigations of Goltz and Ewald on dogs are very interesting and bear some influence on our problem. These workers who were able to keep their animal alive for years after transection or destruction of the spinal cord below the seventh cervical segment observed that

while diarrhea was interposed defecation gradually became normal one or two evacuations were noted daily and on each occasion the rectum was well emptied. Patients following proctosigmoidectomy are capable of voluntary muscular contraction of varying degree noted subjectively and objectively. Approximately 80 per cent of our patients may be classified as continent yet perhaps 40 per cent wear a protective pad or strip of gauze not of necessity but often because a sense of security from soiling is afforded. Truly our most difficult task is with constipated individual who for a period of year have become accustomed to the habitual use of cathartics.

TECHNICAL FACTOR

Thus far our purpose has been to consider the development of surgery of the lower intestine and colostomy elimination to answer inquiry and compare various procedure in which the sphincters are preserved including proctosigmoidectomy with colostomized extirpations. A substantial series of cases namely 73 resections of the colon and rectum performed without colostomy by Babcock and the writer and recently reported (11-17) from their respective services the department of surgery and the department of proctology has served to support previous discussion. We shall now consider our experiences and the technical factor of this operation for which reason my own series of 236 cases of cancer of the anus rectum and sigmoid colon from the department of proctology for the 3 year 7 month period ending April 1944 has been reviewed. In this group there were 143 males and 93 female 236 were white and 20 or 8 per cent were colored the average age was 32 years the extreme 7 and 85. The distribution was as follows sigmoid 27 or 10.54 per cent rectosigmoid 87 or 36.9 per cent rectum 132 or 56.17 per cent and anorectal 10 or 4.2 per cent. The histologic type in 36 of the 56 cases was reported adenocarcinoma 23 or 63.9 per cent epithelioma—squamous cell 6 basal cell 1 malignant melanoma 2 fibrosarcoma 2 and leiomyosarcoma 2. Tumors were graded according to Broder classification in 19 instances grade I 17

cases grade II 17 or 57.9 per cent grade III 67 and grade IV 8.

Of 236 patients I personally resected 208 an operability or resectability rate of 88 per cent. The remaining 28 patients were treated by palliative colostomy exploration and closure local excision or fulguration others refused operation or sought counsel elsewhere. The operative mortality of the 208 cases (16 deaths) was 7.6 per cent. This group included such procedures as the Mikulicz and Rankin modification Babcock's single clamp method of sigmoidectomy and those designed by Cusco Miles Lahey Turner Hartmann and Lockhart Mummery 145 were performed by the Babcock technique of abdominoperineal or perineal proctosigmoidectomy without colostomy and with an anal sigmoidostomy.

As is our custom all patients are admitted to the hospital 5 to 7 days prior to operation. A complete examination including cystometric studies is made and the patient is placed in fluid caloric nitrogen and electrolyte balance. Fluid freely by mouth are encouraged—a minimum of 500 to 3500 cubic centimeters daily unless contraindicated. Sixty to 70 per cent of our patients with rectal and sigmoidal cancer showed hypoproteinemia during the preoperative period the nitrogen equilibrium is established and maintained by a low residue diet in four feedings carbohydrate 400 grams protein 20 grams fat 60 grams and amino acids (casein hydrolysis) reinforced with tryptophan 500 to 400 cubic centimeters (1.5% solution) orally each day. On or more blood transfusion are administered in quantities sufficient to raise the erythrocyte count to four and one half million. To assist in avoiding hemolytic transfusion reactions and their sequelae sodium bicarbonate sufficient to maintain a urinary pH above 7.0 is given. We have come to realize that there is a high incidence of abdominal avitaminosis previously unsuspected but a potentially dangerous stage which may occur as the result of diet inability to utilize vitamins failure of absorption of fat soluble vitamins in the absence of bile or depletion of vitamin reserve by excessive demand in malignancy. Routinely by mouth thiamin chloride 50 milligrams nicotinamide 100



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F d l f Spl t M d P r t nd R t th m t f C itin ly n t l e
 Op r t T t t f k t l d S gm d l C c -H \ E Ba

milligrams ascorbic acid 100 milligrams and pyridoxine 5 milligrams are prescribed daily. On the fifth preoperative day a nonabsorbable sulfonamide is begun by mouth and continued to the morning of operation. Sulfasuxidine succinylsulfathiazole which we have employed in 131 cases (102 proctosigmoidectomies) of our total series is given in an initial dose of 0.5 gram per body kilogram weight followed by a dosage of 0.25 gram per kilogram every 4 hours. More recently sulfathiazidine phthalylsulfathiazole a sulfonamide having a similar mode of action has been used in 54 cases including 19 proctosigmoidectomies. The initial dose is calculated on the basis of 0.1 gram per kilogram weight the maintenance dose is estimated upon the same basis.

All patients in this series with the exception of 2 with acute intestinal obstruction irrespective of age or general condition were operated upon under spinal anesthesia. During the past 18 months fractional or continuous spinal anesthesia has been employed. The Woodbridge formula of 0.3 per cent pontocaine in 4 per cent dextrose solution being used.

OPERATION

Abdominal phase. The abdomen is opened through a left oblique incision 3 centimeters above the inguinal ligament beginning at a point medial to the anterior iliac spine and ending to the right of the midline above the pubic line. Ordinarily the left anterior rectus sheath is divided and in a few instances we have detached both the rectus and pyramidalis muscles from the pubic spine as suggested by Cherny. The liver is examined for metastasis; the median lumbar upper and lower mesocolic areas palpated for nodules and the extent of the growth determined. The patient is placed in the Trendelenburg position and the pelvic cavity is cleared of small intestine by hot packs. The left lateral half of the mesosigmoid is freely divided wide of any malignant infiltration; the incision being carried downward to the rectovesical or rectouterine sulcus. In the course of the dissection the left ureter iliac and the perimatic or ovarian vessel are exposed. The perimatic or ovarian vessel may be divided and ligated.

The sigmoid with attached fat and mesosigmoid is mobilized toward the midline. The peritoneum on the mesial side of the sigmoid is incised downward continued around the right pelvic brim and across the sulcus between the rectum and bladder or uterus to meet its fellow of the opposite side.

Ordinarily transillumination is employed to visualize the inferior mesenteric superior hemorrhoidal and sigmoidal vessels and their communicating arcades. By such greater precision can be exercised of those to be preserved which is essential for that portion of the sigmoid to reach through the perineum. The necessary vessels are clamped divided and doubly ligated. If desired the lateral peritoneal leaflet of the descending colon may be divided in order to slide the bowel to a lower position. Having determined the point of viability by observing pulsating arteries or by the character of the bleeding when the small vessels on the surface of the bowel at the level of resection are incised it is identified with black silk. By gently inserting the hand into the postrectal cellular space in the pelvis the lower pelvic sigmoid and rectum can be stripped from the anterior surface of the sacrum as far as the sacrococcygeal articulation. The lateral ligaments are rendered prominent and divided as far as the upper surface of the levator ani. They may or may not require ligation. Anteriorly the rectum is separated in the female from the upper portion of the vagina and in the male from the base of the bladder as far as the prostate. Care should be exercised to avoid injury to the seminal vesicles and vas deferens. Five grams of sulfathiazole powder are dusted over the viscera which is covered by the great omentum and the peritoneum is closed. Interrupted sutures of No. 32 gauge alloy steel wire are introduced for fascia and No. 35 for skin.

Perineal phase. The patient is changed to the lithotomy position on the specially designed spinal mattress and the rectum is packed loosely with antisepticized gauze. The anal canal is closed at the pectinate or anorectal line by a strong purse-string suture. A posterior incision is made behind the closed anus and carried around and immediately below the closed anorectal line. The sphincter

Of the 145 patients 137 survived the operation a mortality of 5.5 per cent. The 8 deaths were as follows: peritonitis in 4, pulmonary emboli in 2, pneumonia 1 and myocardial failure 1. This was an unselected group excluding growth within 3 centimeters of the sphincter musculature (6 cm. of anal margin). In this series there were 49 consecutive resections with 1 death an operative mortality of 2.04 per cent.

Postoperative treatment. The transfusion of whole blood given during the operation is followed by 5 per cent glucose in isotonic saline solution additional blood and plasma are ordered if there is any doubt as to their need. Inhalation of high concentration of oxygen is given for a minimum of 24 hours for the purpose of effecting a reduction in the amount of nitrogen thereby diminishing intestinal distention (40). Wangersten suction is in force during the operation to avoid vomiting and regurgitation of vomitus into the lungs which according to Wangersten (99) is the most frequent cause of postoperative pneumonia and continued for 48 hours or more.

The patient's status as to hydration and acid base balance which cannot be divorced from each other is of utmost importance. Dryness of the skin, thirst and capillary turgor but especially the urinary output per 24 hours vaporization from skin and lungs comparison with preoperative fluid balance and blood studies the plasma protein specific gravity of blood plasma and whole blood cell volume of venous blood by means of the hematocrit and McLeod-Ulich test for tissue avidity are helpful indices while total serum calcium, bicarbonate content and serum chloride daily urinary chloride concentration loss by perspiration by duodenal suction and by the DeBacock intra-abdominal sump drain will help to a certain electrolyte status.

Nitrogen balance and the level of the blood protein have but recently been recognized as important parts of the preoperative and postoperative care of the cancer patient. It must be realized that there is a period of approximately 2 hours following preoperative anesthesia when parietal administration must not be employed if nitrogen equilibrium is to be maintained. As previously reported

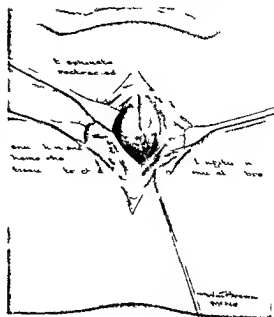
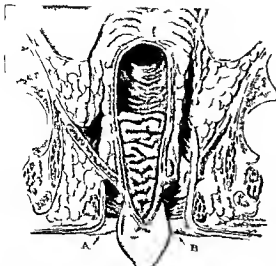


Fig. 1. Diagram illustrating the surgical approach to the rectum and the location of the tumor.

(16) in a series of 57 patients 4 or 3 per cent were held in positive nitrogen balance after operation by the administration of whole blood, blood plasma and amino acids in liberal quantities. In other words 13 or 27 per cent showed serum protein levels below 6.5 grams per 100 cubic centimeters. In contrast however were 71 patients in whom no treatment was given of which number 15 or 88 per cent became hypoproteinemic.

It is our practice following resection to give 2,000 to 4,000 cubic centimeters of fluid each day during the immediate postoperative period or until the patient can tolerate sufficient quantities by mouth. The amounts and values usually required to maintain fluid, caloric, nitrogen and acid base balance approximate the following: 1,000 cubic centimeters 10 per cent glucose in sterile distilled water; 1,000 cubic centimeters 10 per cent glucose in physiologic saline solution with 300 cubic centimeters amino acid (15 per cent of) sodium lactate (1-100 cubic centimeters ampul of M/6 sodium lactate dis-

The most important factors in the maintenance of nitrogen balance are the intake of protein and the excretion of nitrogenous waste products. The intake of protein should be maintained at a level of 100 to 150 grams per day, and the excretion of nitrogenous waste products should be maintained at a level of 10 to 15 grams per day.



level and the number of erythrocytes in the urine. Sodium bicarbonate is used routinely. If the intravenous and oral routes are not feasible a 0.8 per cent sulfanilamide in one sixth molar solution sodium racemic lactate is injected subcutaneously.

Sulfasuxidine succinylsulfathiazole is given in suspension in the same dose as before operation namely 0.5 gram per kilo ram body weight every 4 hours as soon as the patient is able to tolerate liquids by mouth usually on the 3d or 4th postoperative day. As previously reported (17) in our series of 145 cases in which an abdominoperineal proctosigmoidectomy was performed there were 8 deaths 4 of which were due to peritonitis. Of these namely 4 only 1 had been given sulfasuxidine preoperatively but not postoperatively. Sulfathiazole phthalylsulfathiazole has been employed more recently in 34 resections (9 proctosigmoidectomies). The drug given postoperatively in amounts equal to the preoperative dose namely 0.1 gram per kilo ram body weight every 4 hours in suspension as soon as liquids are tolerated by mouth. A definite decrease quantitatively of the coliform organisms has been noted by stool culture. In no instance have we encountered any untoward reaction. It may be mentioned that of our total series of 208 resections to April 1944 in addition those to September 1944 intra abdominal soiling occurred in 12 instances as the result of perforation at the time of resection contamination in open anastomosis or slipping of the clamp in closed anastomosis yet there has been no fatality.

Abdominal wound infection and dehiscence have been infrequent complications and to a great measure we believe that it has been due to the maintenance of adequate protein and vitamin C levels and to the use of oblique muscle splitting incision and Babcock's alloy steel wire. In our series there were 2 instances of abdominal wound infection in 145 cases or 1.3 per cent.

Following proctosigmoidectomy patients are permitted out of bed usually on the 6th to 9th day and recently the majority have been discharged from the hospital on the 11th postoperative day. Approximation of the posterior sphincter musculature is made by

F 1 Sph t m les 1 t d l t lly
po g th l t t B L t m l h be
l mp d d d d l t d G l t d
pt l t h a th l d t m

dissolved in 500 cubic centimeters 10 per cent glucose in sterile distilled water represents a one sixth molar solution and is equivalent to 8.4 grams sodium bicarbonate) sodium sulfathiazole 2 grams twice daily dissolved in 40 cubic centimeter of sterile distilled water blood plasma or lyovac 50 cubic centimeters daily and whole blood 500 cubic centimeters on 1st and 3d postoperative day. Such represents a fluid intake of 5,480 cubic centimeters a caloric value of 605 nitrogen 6.5 gram sodium chloride 16 grams and sodium bicarbonate 16.8 grams.

Ordinarily the intravenous route of administration is employed but when access to vein is difficult we do not hesitate to utilize the subcutaneous and intra ternal means of injection. In no instance have we encountered any untoward reaction with blood blood plasma glucose and saline or amino acids (5 per cent solution) when the intra ternal route has been used.

The resources offered by modern chemotherapy are of paramount value in preventing and combatting infection especially peritonitis. Patients are given sodium sulfathiazole 2 grams twice daily beginning the morning following operation. Guides are the urinary output the blood sulfathiazole

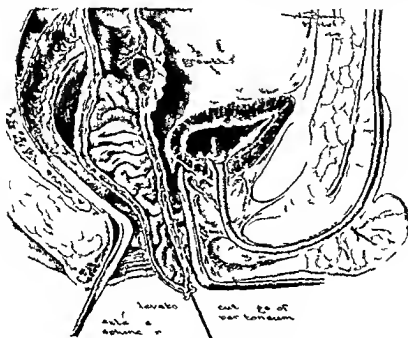


Fig. 1. Sphincter preservation operation. The diagram shows the rectum and sigmoid colon with the tumor and the site of the sphincter preservation operation. Labels include 'tumor', 'sphincter', 'rectum', and 'sigmoid colon'.

fore the patient leaves the hospital but if there is purulent drainage from the presacral area the sphincteroplasty is postponed for 1 month. The operation requires not more than 3 days hospitalization.

It is worthy of mention that the presacral wound consumes about 3 weeks for complete healing and closure—approximately that of an ordinary anorectal fistula. Thus in the majority of our recent cases patients have been able to return to their former or perhaps lighter occupations in an average of 6 to 10 weeks following operation. In our other type of abdominoperineal extirpations in which a large perineal wound is made at least 3 months was the average period required for healing (12).

SUMMARY AND CONCLUSIONS

The evolution of surgical extirpation for rectal and low sigmoid cancer designed to eliminate the external stoma of an abdominal colostomy has been discussed. A serious effort is being made in this respect. It has been shown that preservation of the sphincter

muscles does not augment the operative mortality. In more than 80 per cent of the cases the sphincter musculature may be preserved and so far as one can judge it does not affect the rate of survival.

From a gross series of 712 cases in which radical resection was performed without colostomy, a group of 208 personal extirpations of the rectum and sigmoid for carcinoma has been selected as the basis for this discussion and therefore an attempt has been made to evaluate and compare impartially this series with other present day procedures.

It is our opinion that the Babcock abdominoperineal technique of proctosigmoidectomy without colostomy and with preservation of the sphincter muscle possesses merit. It permits radical removal of the malignant bowel and gland-bearing areas and in spite of a high rate of resectability (81 per cent) enjoys a low operative mortality (5 per cent in 145 resections) of 40 per cent in 40 consecutive resections. It all with early discharge of the patient from the hospital reduces the period of wound healing and affords early return to work.

Improvements and refinements in technique such as the establishment of an antero-lateral pelvic diaphragm have prevented descent of small bowel into the perineal wound precise maintenance of essential blood supply has avoided retraction and necrosis and preservation of the sphincter musculature has offered varying degrees of continence. It must be realized and we are frank to admit that the sphincter function following proctostomectomy is not perfect nor that for which we strive yet in approximately 80 per cent of our cases continence is cited and between 90 to 95 per cent of patients are able to carry out their daily occupations without inconvenience. If one may judge from the 51 patients in whom the abdominal colostomy was transplanted to the perineum then a perineal anus or anal stomodostomy is a distinct improvement over even a well constructed stoma in the abdomen.

Finally the physiologic derangement of patients with rectal cancer in whom extirpation is contemplated is deserving of careful consideration and therefore special attention should be directed toward the maintenance of the fluid caloric nitrogen and acid base balance.

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 6 AR H R W t J S 937 4 8
 AR LD H R d S J F A h S 94
 8 BA coc W W S Ch N Am 93
 9 Id m S g Gyn Obst 94 7 48
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 46 G ME R K d D t d C A S 938
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 47 G RD D Ch h M d 86 4 463
 48 G F d L J R A h g I h y l 89
 63 36
 40 GO CH R V P pl A t my P 7 N
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 G Tu z C Mod m Op t S g ry d d
 V l p B l m W m Wood & C 93
 HA D E P Th R t m d C l P 303
 Phil d l phu L & F b 939
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 4 HO J S S Gyn Obst 937 64 33
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EXPERIENCES WITH ANEURYSMS IN AN OVERSEAS GENERAL HOSPITAL

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THIS report is limited to arterial injuries which have not necessitated ligation at the time of the original debridement. In a general hospital in a theater of operations the majority of such cases consist of aneurysms either false or arteriovenous in type. The term pulsating hematoma is used interchangeably with false aneurysm to designate any arterial leak which results in a blood or clot filled sac into which the artery is continually pouring some blood so that a palpable thrill or an audible bruit or a steadily enlarging mass are characteristic findings. The enclosing sac may be little more than partially organized clot bounded by muscle, fascial or skin surfaces or it may be a fibrous firm reasonably stable envelope depending upon the site or duration of the lesion. In loose areolar tissue such as the retroperitoneal space a leaking

From the General Surgical Section, Civil Hospital.



F d b
(Left and Right)

artery gives rise to a progressively enlarging hematoma. Although pulsation and bruit may not be detectable the process has the characteristics of a false aneurysm, i.e., it has the opening in the artery, the same progressive enlargement and possibility of hemorrhage. Arteriovenous aneurysms although of considerable interest do not constitute as much of a problem in this theater as do the false aneurysms. For this reason emphasis is laid upon the latter.

The lesions which we are discussing represent arterial injuries that are not usually apparent at the time of the initial debridement. They are caused by a variety of missiles. The series includes gunshot wound (rifle, machine gun, revolver) and all sizes of shell fragments. In the formation of an aneurysm there must be one constant condition; however the injury to the vessel must be partial and therefore a small fragment is the usual cause. Should complete severance of a vessel occur retraction and clotting will take place or the vessel will have to be clamped and tied and no aneurysm will be formed. These are the problems of the forward hospital. In only 1 of our cases was this condition not apparent (see Case 9).

We have observed 30 cases of aneurysm in the past 20 months of overseas operation. Of these 20 have been false and 10 arteriovenous in type. Figure 1 reveals several significant facts. Nineteen of the 20 patients with false aneurysm were operated upon. Serious hemorrhage either externally or internally into the tissues was the indication for emergency surgery in 12 of these. The duration of the lesion varied from 4 days to 3 months. In the arteriovenous group of 10 cases all of them in one major vessel no patient was operated upon for hemorrhage. If the decompression effect of the attached aneurysm is considered the result to be expected. Further the series shows that gangrene should rarely



Fig. 1 c 1 d

Fig. 1 c 1 d
 1 g N y flm f m C se 6 At y m f f m l sel
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 l k fl f th sa t D od t t dy mm l l y ft l se fl
 mp d l y how g c m pl t fl g f th f be sa S foot h t flm
 h t l p pe t ca l g m t d S foot h t flm h g t f

following ligation of major vessels if there has been an adequate time interval for the development of collateral channels and time for the restoration of blood which may have been lost in large quantity after the patient was wounded.

Often the presence of the lesion is not discovered for some days or weeks. Perhaps many small leaks seal off and never break down. In some the vessel wall may have only been contused with later rupture through the weakened wall. In 1 case not reported here a false aneurysm of the 1 rachial artery made its appearance 3 months after injury. In the arteriovenous type there is almost always a period of a few days before a diagnosis is made. Often it is weeks or months. In this connection it might be well to predict that many of these lesions will be discovered in the zone of the interior since small fistulae may cause no symptom.

Diagnosis is very simple in almost all cases in which a murmur or audible bruit is discovered. There may be a so-called pain. The murmur heard over the false type has been systolic in time in all our cases. Often the actual vessel involved may be difficult to determine but

it is always assumed to be the major vessel until proved otherwise. In all of the arteriovenous aneurysms the murmur has been continuous with a systolic accentuation. In this type the slowing of the heart rate upon obliteration of the fistula is pathognomonic (Branham's sign). The reflex blood pressure changes have not been constant in the early cases. In certain vessels this test cannot be applied e.g. the subclavian. Venous pressure measurements may help.

Differentiation between the two types of aneurysm is essential because of the difference in treatment. Not only are the arteriovenous cases safe for transport but they seem to require a longer period for the establishment of adequate collateral circulation. Hence these patients usually are evacuated to the zone of the interior unless intervention is indicated because of increasing nerve symptoms. The association of a large unstable false sac or because it is necessary to improve the distal circulation which has already been shown to be inadequate.

Change in cardiac physiology of a serious nature are not anticipated for 3 months at least. In Case 16 almost 4 months after



F b D w t p t C 6

wounding there was demonstrable cardiac enlargement but the return to normal was rapid following operation. Tachycardia may be noted early especially in fistulas near the heart but since the Army patient remains in a hospital throughout the course of his illness observation will preclude any deleterious effects. Embolism arising from either type of aneurysm has not been noted in this series.

There is one pitfall in the diagnosis. A firm hard mass over which the skin is red dened is not necessarily an abscess. In Cases 2 and 1 a preoperative diagnosis of abscess was made. In Case 12 considerable numbness was required to prevent fatal hemorrhage. In another abscess beneath the angle of the jaw incision resulted in a sizeable stream of blood from the internal maxillary artery which although easily controlled was quite unexpected. Aspiration of any suspicious mass should always be done first. When clot or blood is found attention is directed immediately to the proximal and distal control points.

At the base hospital under careful observation it is justifiable and desirable to postpone intervention as long as possible. Risk of hemorrhage or critical diminution of circulation is lessened by means of pressure dressings, immobilization and perhaps sympathectomy. Every effort is directed toward carrying a limb long enough to survive on its collaterals when complete obliteration of the channel becomes necessary. The majority of the limbs distal to the false aneurysms present a palpable pulsation even when the leak is a large one showing that some blood is reaching the limb through the main vessel. Thus a slowly enlarging aneurysm or a hematoma may be looked upon as a desirable safety valve in any case in which early ligation otherwise will result in gangrene.

Collateral circulation anatomically consists of a reasonably constant set of vessels which may take over the blood supply to a part in the event of interruption of the main artery at any given point. Physiologically there is little that is constant about it. Swell in spasm and infection play important roles. The evaluation of the adequacy of collateral circulation may be very difficult. If the vessel proximal to the site of injury is available for selective compression Matas' test is easily applied. In many of the cases this procedure has not been possible and since the majority of the operations have been on an emergency basis the prognostic value of such procedures is slight in false aneurysms. However in the evaluation of the case there are certain guides to the safety of future operation. A diminished or absent arterial pulse in a warm or pink distal extremity obviously is a good omen for one is certain that pressure is being put upon the collateral channels which are already functioning. A normal pulsation prompts one to prolong the observation period as long as possible.

When the circulation is critical certain observations are made to determine whether or not it is safe to observe longer. The presence or absence of a distal arterial pulse is determined manually or by means of the sphygmomanometer. The temperature is noted with the part exposed to room temperature and the

blanching reaction noted by elevation of the limb to 30 or 40 degrees. The color is quite important but may be a poor sign in dark skinned individuals. Pinkness is always a good sign but cyanosis may be misleading in that fairly good circulation may exist in its presence. Whiteness is of course significant. Nail bed reactions to pressure have been found very valuable. More elaborate tests even when possible in this theater have not been found to be necessary. Decisions which are based upon the data mentioned have proved sufficient.

In critical cases the value of interruption of sympathetic impulses is very great. In the emergency cases such treatment can be carried out immediately prior to the attack on the vessel. In elective cases it is usually done a week before. The danger of initiating spasm during operative manipulation is reduced. Five cases have been sympathectomized—3 femoral lesions and 2 popliteal. In all it was felt that the procedure was of definite value. Novocain block of the sympathetic chain single or repeated was done in 3 cases—1 femoral and 2 popliteal aneurysms. The blocks seemed helpful in all cases but whether essential or not could not be said. No help was needed in any of the upper extremity cases and no blocks were done. If uncertainty as to the adequacy of circulation following proposed obliteration of a large vessel exists especially in emergency procedures it would seem unjustifiable not to employ sympathectomy if the patient can tolerate additional surgery. In the lower extremity the procedure may be necessary for the later rehabilitation of the limb anyway. Novocain block as a test of the efficacy of proposed sympathectomy has not been satisfactory. Usually the need is urgent and permanency is desired. Lumbar sympathectomy is performed through a muscle splitting flank incision with resection of the 2nd, 3rd and 4th ganglia.

In the series of false aneurysm there were 6 cases with associated nerve injury. If the minor vessel and retroperitoneal cases be omitted this incidence becomes 60 per cent. The high rate is to be expected because of the proximity of the nerves to the great vessels.



Fig 3 Diodrast dye film taken 9 days after operation. Shows the film S t t

Although of course primary consideration must be given to the vascular lesion increasing nerve symptoms may hasten the elective operation. At times ischemic paralysis must be distinguished. The increasing toughness of the fibrous tissue reaction excited by an aneurysm is a very formidable process and lysis of a nerve from this scar becomes increasingly difficult with time. Thus an indication for early intervention may be to facilitate dissection if the nerve be an important one. Because of the usually long operating time required to take care of the arterial injury and because of the distortion of tissues and occasional infections formal suture of nerves is seldom possible at the same time. Lysis is performed and if the nerves are severed ly is with simple approximation of the ends is done as a first stage procedure. Fibrin film has been used in several cases in the preparation of the bed for a subsequent formal neurovascular anastomosis.

Giving each man adequate care in a busy general hospital leaves little time for purely investigative research into the material at hand. Visualization of these arterial lesions by injection of diodrast (35%) is simple however and sometime may be of direct assistance in their care. Injection of diodrast may be quite innocuous but the observation has been made that fresh clot may be laid down in aneurysmal sacs following its use although no thrombosis in the vessels themselves has occurred (2). Figure 1 a and b (Case 16) shows x ray pictures of an arteriovenous aneurysm of the femoral artery and vein with

basis of very convincing experiments advocates resection of a major vessel up to the next large collateral in order to obliterate a blind pouch with consequent arterial pressure dissipation. Figure 3 shows the collateral vessel to the gastrocnemius assuming a very essential function at operation this vessel was but a thread and upon the basis of the criteria mentioned might have been sacrificed. Classical main collateral channels are subject to so many anatomical variations (see Cases 6 and 7) that we do not believe that any vessel should be sacrificed. The size of the arterial branches can be very deceptive and spasm may completely conceal the importance of a vessel which is otherwise apparently insignificant.

The following case abstracts give only the barest essential data to illustrate the foregoing discussion.

CASE REPORTS

CASE 1: J Z file urym of brach lartery. Repated external hemo hage thro ghsm larpuncture wound at lbow we contr lled by pr D el pment of a pubat ghem t m. Emeg ey op rati n was done 2 w ls after i j ry f r i creas ns of the b matom. Al it d n l n behid the b furcat on of the brach al t ry was t d Rad l and ul ar p le we go d ft ward d ma t ned Retu n d to d t 3 w ls

This is the only case in which simple suture was possible and feasible

CASE 2: A K fal n u ysm f p m pe fo s b anch f pr f da f m s. A large red ndurat d mass f upp post o thigh d agnos d a sb ces as op rat d pon 6 h aft wound g Asp ton e led th t e tate f fia rs b themo b g a mm di t and d q i d co t o f the fem ral arte y q ckly. E pos e dilgato of sm ll p t lly t n s l w e don Brut w s n t l tened f p io t pe at on Un entful re co ery

CASE 3: D M f lse neury m of popl teal t ry Hemo h g f m d b d d p p lte f w u d w n ted n arri alath p tal from F c 3 day aft r i j ry S l r s p was co d nly dos d nd pressu d esing w applied Th e m e h m rhages occu d du g ne t s w ls with d cl pment of m nd brut Fu th bl di d m ge cv pe af n was cr r d ut by Capt i J h M dlm Ap f r ted femo al rtery was f u d (t popl te l j n t o) thrugh and thr gh w nd both b les pate t Res ton f ju d p rti n d l gat n we e d Sympath ct my was d n n t

day becaus f cr t cal ci cul ti then u e entul r e 3

CASE 4: A J S f lse a ysm f thi d po tion of xill ry tery kn adial a d ulnar pals es th typical p l t g mass p ese t a ulf The wo d was gran l ti g P es c of bloody dis cha g was noted o the 26th day aft r i j ry and was f ared to be a ign f th atened hemorrhage Op ti was perf rmed th t d y The nerves we e de t f d (both e e d) the s c was dissected o t d is d P o smal l gation was perf r m d bet een ant or and post r r ci cumf x h m al vessel Th nerves we app o imat d C cula t te t d du ng ope at u was sat sfactory post p at e f y Patient was se t to e of inte i f r f m al n e r p a

CASE 5: H S f lse ane r ysm of xillary r t ry Th was slo incr ase i the s i f the infra d cular mass t first it was d g os d as a deep ab ces ith t t i d foreign b dy Brut appe ed and pe t was p rform d 8 we ls ft r i j ry Alth gh th radial pulse was good p rati was not post po d l g r b ca e of th i crasing p l y s f the m d n and ul ar n rves A small te n th tery was fou d just pro imal t h ju ction of the med i a d lateral cords of the b ch l plexus Th w s fee bleeding from th d tle d of the vess l The t ry was di r d d l t d and segm t o f n esect d The m d l co d d ulnar n e ere badly to b t ill m conta ty Lv is f b th nerves was d e with filma film inse t d b ut th m Co rse was ne e t f f P t i s e t t d b fit to seco dary ene p r

CASE 6: N F f lse ane r ysm of femoral r tery A kno n f l e a e r ysm f th thigh was unde observat on It b g t enla g s d d enly ndr pidly 2 mo ths ft r i j ry Bed rest had hee m d t ry beca s of oth i junes (fract es) Em r g cyope at n u d r i niquet was n cess ry f ce tmet r r a r i a t r y j st p oimtal t adduct r ca al with y la g hem t ma cavity (2000 c.c.) Artery and e w esect d dilg d Sympa th ctomy w d en t day b cau of critical c cul tuon Th e s lle t warmth f foot 3 day l t S bseq ent co rse was u complicated

CASE 7: M V f lse a e r ysm of femoral r t ry A kn w false of thigh w d r b ratio I cr ase i ze was the sudd n w th d m nd pa alysis of fo t 5 weeks aft r i j ry Em r g ncy ope ti n was d et p 7 centum te l tin the t r y j t a b v th adductor ca l with 800 cub c t m t r ca ty Bl k mo t bes w al bl phe ous v n gm t was em ed b t not d beca s f t chical d ficult es Exci f j d segm t w th ligat was perf rmed A c m p ying en w s es ct d Ly f con t d f al r v was ca d t Circul t was good eco ry u t f l

Cases 6 and 7 are similar both as to the location of the injury and clinical course up to

operation Note difference in circulation after operation

CASE 8 D H false aneurysm of popliteal artery. There was a known false aneurysm in the popliteal space with edema of the foot. Sudden enlargement followed an attempt to get into a wheel chair 4 weeks after injury. Swelling was controlled by pressure but edema increased and the mass enlarged into the calf. Emergency operation was done 2 days later with ligation and resection of a partly torn artery. The vein was resected and the contused tibial nerve lysed. Sympathetic block 1 hour after operation (pontocaine) used as spinal analgesic was given. Circulation was good and there was a rapid subsidence of the edema. The wound was moderately infected.

CASE 9 S V false aneurysm of popliteal artery. The foot with very critical circulation was seen by us 3 days after injury. It was a cold pulseless limb with sensory and motor complete paralysis and a sensation above the ankle. There was a bruit over the popliteal space. No tenderness was given intrafemorally. The femur in association to a small perforating popliteal artery was there as slight blanching of the nail beds, the leg was splinted and 1000 cubic centimeters of blood given. Twelve hours after admission a severe hemorrhage occurred from the medial condyle necessitating a tourniquet (25 minutes) and causing shock. Transfusion as given. The foot was icy cold blotchy and the calf stony hard. There was no bruit. Operation done by resection of the artery (available until then) sympathetic resection of a length of saphenous vein and anastomosis of the popliteal artery to the posterior tibial over Blakemore tubes and the vein segment bridged 3 centimeters distal. A functional channel was obtained. No heparin was available. Ligation of contused tibial nerve was done and the wound partially closed. (Operation time 2 hours 5 minutes). There were several critical days though warmth and color. Second closure of the wound as 7 days later. There was a slight increase from the distal portion of the wound in the thigh which was thought to be from the superficial tissues. No bruising or rebleeding was present. The patient 4 weeks after operation latent but yet able to walk foot dependent. Distal distal segment no further gain in the thigh postoperative days.

(The patient had stricture of the artery at the bifurcation. The posterior tibial had tract debent the gas-trocnemius. Nothing was left of the anterior tibial except the strip of tissue from the artery which became till connected to the popliteal artery. The calf with the tendon predicted from the thigh. The artery thus formed a goodly at present.)

CASE 10 J B false aneurysm of femoral artery. The patient fell from a ladder and was struck on the thigh. In the morning distal to the point of impact there was a swelling.

front. A second laparotomy was done 1 week later at the same hospital for intestinal obstruction due to a Richter's type hernia. He developed severe abdominal pain 10 days after the operation on a boat in transit to the base. On admission he was 17 days after wound. The laparotomy wounds were clean and healing. There were a thrill and bruit over the 16 centimeter mass in the abdomen pressing to the left of the midline. Spontaneous rupture occurred next day with deep shock and rapid progress toward a moribund state. Immediate laparotomy was done under local anesthesia. A large ill-defined sac was present within the mesenteries. Patient died on the table despite massive blood transfusions. The site of the vascular injury was not found at postmortem examination.

CASE 11 G M progressively enlarging hematoma of the retroperitoneal space. There was a sudden onset of severe abdominal pain 2 weeks after laparotomy at the front for a penetrating wound of the abdomen. Diagnosis of retroperitoneal hemorrhage was made but operation was postponed because of poor condition. Laparotomy was done 2 days later. There was a huge retroperitoneal hematoma on the right which on aspiration yielded dark clotted blood. A thrill was felt. The process was believed to be stationary. The abdomen was closed. There was progressive difficulty after operation with pain distention then hematemesis, melena and hemoptysis up to death. At postmortem examination on extension of the hematomas was seen to have reached all mesenteries and the whole retroperitoneal space was greatly ballooned out. The responsible vessel was not found.

CASE 12 R M progressively enlarging hematoma of retroperitoneal space. There was a penetrating wound of the pelvis through the sciatic notch. The abdomen was not palpable at front. Three weeks later a large mass was discovered palpable both clinically and abdominally accompanied by severe symptoms of mild obstruction. A shell fragment 5 centimeters in diameter was present in the retroperitoneum. Laparotomy was done for a suspected abscess which was found to be a hematoma by aspiration. The mass was opened transabdominally with immediate cessation of bleeding controlled by pressure on the right hypogastric artery. This esophagus was exposed and debrided and ligated. The clot and foreign body were removed followed by recurrence of bleeding from deep within pelvis. Only contralateral pelvic abscess with large gauze packs soaked in morphine. The pack was left in for 5 days then removed. There had been no recurrence of hemorrhage at 5 weeks.

CASE 13 W D a true venous aneurysm of popliteal artery. A popliteal artery aneurysm of the popliteal artery with fistula into a subcutaneous space 6 centimeters in diameter were noted. There was a bradycardiac reaction of 0 beat per minute upon obliteration of the fistula. Patient was allowed to be ambulatory and observed for 8 weeks. Elective repair could be considered in the

the sac a distal q d upl gat a d esect
of a egme t of th p pl t l ven Sympath t c
block as done o fte ope at on C urs
un v ntl l Five months follow up fr mpt tent
hiking o miles a day sth ut difficulty Coming
back v rs as

CASE 4 R C rte iovenous an urysm f the ax l
lary artery a d v n A typical arte i ven le ion
with c 4 centimet rs in di mete p esented beneath
the clav cle Pat ent b rved for 6 v e lsa d p at d
p n 2 m nths aft r j r y b a s f p g e s i
un rp l y s i T a ectio d med l et ct ion of
th n r two th d of clav cl (g v nge cellent e
p e with t r s ct f th b ne) pr x mal a d
d stal e po u e d e n t l f ves l d s s t f
th sac fistula and plex th ly is f th ul
ne e e e d n E c o quad uple l tion The
clavicle w re it d by m ans of a 4 cent mete
l gth of K rschne t e f c d t the ma ro
cavities (const ct g sho lder d sig was d
s d postope t ly) U e ent l c v ry Pa
tient s nt to zo e of i t r becau e of s t d
jurie (ev re hemoth)

CASE 15 J A artero en s aneu ysm f p
fici l f moral t y and ve Pat t ente ed h
p t l 4 days afte j ry with h d calf edem t
foot and b g n ng gr nou dem at n of toe
Th we e mall pu ct vou ds f both th
femo al and p pl t a s no p l t Sym
pathetic blocks n t o o c as ns we e th ght to
have softe d the calf lightly An t e o
l i n of th femo l es el 5 c ntum t s belo
Poupa t s lig m nt s d scov d by th pat nt 5
eeks after i ju y Sympathectomy was d e fol
l wed by xci i of th nstul nd qu d ple l g
t n 7 d y s lat (N false) R c very w s
uneventf l The circult n to the l r leg wa
d f i tely bette mmed t ly f llo i g clo e of
th fistul as it b d al o h n ster sympat t my
P or to vacu to imple gullotm amp tat on
j st ab v the kl s d It was felt that th
pe t ns might hav aved pot n of th l
l g

CASE 6 W H t o a e ysm f the
f mo al e s l s A typ cal l on v th th l g f l
ll t t d n Figue Th we o symptom
a d th sac was discov d q t accid nt lly d r g
a ut ech ck off p t t h l e l w n d 3 m th
ft r j y Symp th tomy was f llow d n 7
d y s by m pl t e c n sth and fist l d
q ad pl l g t o Pat nt was l k g d v
The les on was op rated up n th th ate b ca s
of th l g of th fal s c d p s bility f
pt

The remaining 6 cases of arteriovenous
aneurysm were evacuated to the zone of the
interior for treatment Their lesions seemed
perfectly stable and it was not justifiable to
wait out the ob servation period overseas The
single patient with false aneurysm who vas

TABLE I — ANALYSIS OF MATERIAL

	P l	y m
T tal cas		
M j	l	
Mh	ss l	
R t p n r	l as	
A oc t d	rv l	ll m j as
T tal mb	p t d p	
H m b	d tu	
N l s	d cat	t l ssel
E ly lect	l tu	
Gan		
D th (b th	t p nt	l gr p)
	A le	y m
T tal an ur y m (e)
M j	sel	
Ass tat d	rv l ns	
Numb	p t d po	
F h m h		
F e		
F d	ptur f	j ry
T mp	ircul t	d tally
G r e	(tabl h d	dm)
Death	(unr l t d b ain	bac)

sent home unoperated upon had a subclavian
lesion of small size which after a months ob
servation became even smaller

Cases 1 4 8 13 and 14 have been pre
viously reported in detail (3)

SUMMARY AND CONCLUSIONS

Observations on 30 patients with aneu
rysms (20 false 10 arteriovenous) are pre
sented On the basis of these case the follow
ing conclusions are drawn

The tendency of false aneurysms to bleed
unexpectedly and profusely is so marked that
in such cases operation should be carried out
before evacuation to the zone of the interior
even if a period of several months observa
tion is required before li ation can be per
formed safely

On the other hand patients with arterio
venous aneurysms are much more stable do
not tend to bleed require a lon er observa
tion period and can be evacuated safely to
the zone of the interior unless some indication
exists for early surgery such as for example
an additional large false sac or increasin
nerve damage

Aneurysms of the retroperitoneal space
are serious lesion and will require the ur
geon s utmo t skill to achieve success

Aneurysms may simulate absces so closely
that alertness must be practiced Aspirati n

should be done at the time of operation if any doubt exists

Classical channels of collateral circulation are extremely variable. No vessel however small should be sacrificed deliberately. Spasm may obscure the importance of an apparently insignificant arterial branch.

If any doubt of adequacy of circulation exists operative sympathectomy should be performed. Sympathetic block with novocain

is temporary and cannot be relied upon in all cases. It should be reserved for those instances only in which additional surgery can not be tolerated.

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Th at f Ope t 944 N 5
4 HO M F E S g Cy Ob t 944 78 75

PENICILLIN THERAPY IN ACUTE OSTEOMYELITIS

W A ALTEMEIER MD FACS d J A HELMSWORTH MD C c t Oho

THE management of acute osteomyelitis has been unsatisfactory and the results uncertain. Diagnosis has been difficult and the disease has often been unrecognized until extensive destruction of bone occurred. Even when early diagnosis was made and surgical drainage instituted early a chronic suppurative process usually followed characterized by draining sinuses, sequestration, local formation of greatly thickened and churning new bone, soft tissue abscesses and recurrent acute exacerbations. Although the original infection became greatly attenuated in time, sinuses often persisted and discharged pus intermittently for years. Sequestrectomy or saucerization of chronically infected bone usually produced healing but offered no guarantee against recurrences. Too frequently the disease appeared to be cured only to flare up after a period of months or many years. The illness has been commonly seen in childhood and the chronicity of the process required long periods of treatment which removed the child from school and physical play. For these reasons and the uncertainty of the outcome, permanent personality changes became engrafted upon other sequelae of the disease such as limp, deformity or ankylosis of adjacent joints.

Chemotherapy with sulfonamides used in association with tuned surgical intervention aided in the management but left much to be desired.

In March 1943 Florey had prophesied that one might anticipate the time when osteomyelitis treated early and intensively with penicillin would not require surgical intervention.

MATERIAL

During the past months we have observed the results of treatment in 34 cases of acute osteomyelitis with penicillin (Table I).

F m th D parten t f Sar gr f h Una ra f Co
mna ti C li g f Medi m and Cas nash Gen ral Hospi tal
Th w k desc bed this pape was d d ra t
ecomd ded b th C mna Med al Resea h b twee
b Offi f b Research d Dev f pm t and th
Lut rsty f C mna

In the group there were 25 cases of acute hematogenous osteomyelitis of the major long bone, some of which also had involvement of the flat bones of the pelvis. In addition there were 3 cases with infection of the pelvic bones, only 5 of the facial and cranial bones and 1 of the ribs. In 13 instances the process involved two or more bones simultaneously. The ages of 30 of the cases were in the first three decades of life illustrating again the prevalence of the disease in the young. Nine of the patients were females and 25 were males, a fact emphasizing the higher incidence of the disease in the male. The portals of entry of the hematogenous infection were apparently the pharynx or nasopharynx in 5 instances, furuncles or other localized skin or wound infections in 8 instances and unknown in the remainder. Two of the patients had diabetes mellitus, 1 had rickets in addition to the acute bone infection. The responsible etiologic agent was determined in every instance but 1 and was found to be the hemolytic *Staphylococcus aureus* in 29 cases, the nonhemolytic *Staphylococcus albus* in 2, the *Streptococcus hemolyticus* in 1 and the pneumococcus type III in 1. In 6 instances the nonhemolytic streptococcus was found in the pus in association with the hemolytic *Staphylococcus aureus*. Detailed bacteriologic examinations were made of the blood in all patients and of the pus in 21 of the cases. Positive blood cultures were obtained in 20 of the cases, the *Staphylococcus aureus* being recovered in 19 instances and the pneumococcus type III in 1. The nonhemolytic streptococcus was found in association with the hemolytic *Staphylococcus aureus* in 2 cases.

METHOD

The administration of penicillin was regarded as the primary treatment of each case and every effort was made to observe the full effect of the single agent before any change was made in the therapeutic regimen although it was not always possible to follow this procedure.

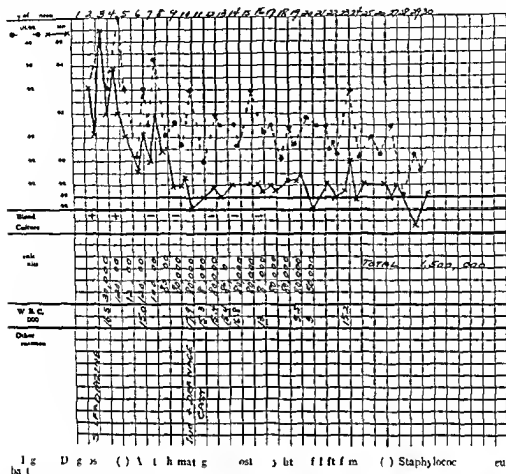
TABLE I—RESULTS OF PENICILLIN IN 34 CASES

N	Ag	Se	Penicillin	I m	Bacteria				
					HSA	NHSA	HS	NHS	P
		F	P tal	N	+				
		F	L. fro l	N	+				
3		M	L. db l	N	+				
4		M	R f m L b d f b l	N	+				
	5	M	L b	N	+				
6		M	R b	N	+				
7	5	F	R f m L t	N	+				
8	6	F	R M 6 h b	N		+			
		F	M d b l	N	+			+	
		M	L. ac bul m L h m ru f m l	+	N	+			
	5	F	P t m p o l d o c g t a l	N		+		+	
		F	L. h m ru	N	+			+	
		F	L. f m and b l m	N	+				
		F	L. pub isch m	N	+				
9		I	R sac ol re	N	N f u d				
6		M	R f m ac bul m R p l sch m	N			+		
7		F	R. bia	N	+				
8	m	M	L f m	N					+
		F	R. pub mus	Yes	+			+	
	mo	M	R 6 h d h t	N	+			+	
	8	M	L h m ru	N	+				
		M	R. fua l	N	+			+	
		M	M ll	N	+				
	5	M	L f m	N	+				
1		F	L. ac b l m M m	N	+				
		F	L f m L l m	N	+				
		M	L b ru	N	+				
		I	L l	N	+				
		I	L. b db l	N	+				
		I	R b	N	+				
		I	R l	N	+				
		F	L h ru	Yes	+				
		M	L h ua	N	+				
3		M	R h	Yes	+				

H A Hemoly S h koccus
 N HSA sub molytic ph laeureu ba
 M L emoly replacac
 N H S unhemol ep auc
 Fura Pae moccus

Solutions of the sodium salt of penicillin in sterile physiological saline with a concentration of 5000 units per cubic centimeter were used in all but 1 case in which the calcium salt was employed. Care was taken to keep the solutions refrigerated at all times. The

solution was administered by continuous intravenous drip in 10 cases and by interval intravenous or intramuscular injection in the remainder (Table II). The length of the interval usually was 3 hours but varied from 2 to 4 hours depending upon the severity of the in



administered at the rate of 25 to 30 drops per minute. The dose was decreased when it was apparent that the infection was well controlled. In several of the earlier cases only 140,000 to 500,000 units were received as the total dose which should probably be considered an inadequate amount. Experience has shown that a dose of 1,500,000 or more units administered over a period of 2 or more weeks is a desirable dosage.

As small soft tissue abscesses developed they were aspirated with syringe and needle and partially filled with a solution of penicillin containing 5000 units per cubic centimeter every 2 or more days. In neglected cases with large abscesses incision and drainage was carried out after adequate preoperative preparation. In 3 instances topical application was effected by dressings saturated with penicillin.

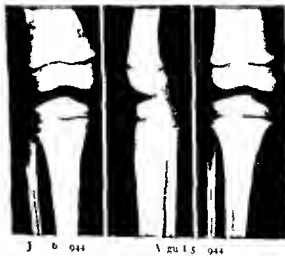


Fig. B S Case 7

TABLE II

P enicillin Th erapy					S ymptomatic Respon			
N	Interval	R	Treatment	Total dose	N	I & D	Os res	Sequelae
	5 000	T 1	hrs	5 000	-	-	+	
	000	IV I I	h	00 000	-	+	+	
	5 000	I f	h	000	+	-		
	000	IV I f	hrs	5 000	+	-	-	
5	000	I f	hrs	5 000	+	-	-	
6	000	IV	d hrs	000	+	-	-	
	5 000	IV	Continuous drip	45 000	-	+		
8	000	IV	Continuous drip	00 000	-	+	+	
	000	IV	Continuous drip	000	+	-	-	
	000	IV	Continuous drip	000	+	-		
	5 000	IV	Continuous drip	000	-	+	+	
	000	IV	Continuous drip	60 000	-	+	+	
	000	IV	hrs	00	-	+	-	
	000	IV	Continuous drip	30 000	+	-	-	
5	000	IV	hrs	215 000	+	-	-	
	000	IV	Continuous drip	6 000	-	+	-	
7	5 000	IM	hrs	6 000	-	+	-	
8	000	IV IM	3 hrs	000	-	+	-	
	000	IV IM	hrs	20 000	-	+	-	
	000	IM	hrs	5 000	+	-	-	
	000	IM	hrs	000	+	-	-	
	000	IM	hrs	6 000	+	-	-	
	5 000	IM IV	hrs	000	-	+	-	
	000	IM	hrs	000	+	-	-	
5	000	IV	Continuous drip	000	-	+	-	
6	000	IV	Continuous drip	000	-	+	-	
	000	I f	hrs		+			
	000	I f	h					
8	000	I f	hrs	000	+		-	
	000	IM	h	000	-	+	-	
	5 000	IM	h	00 000	+		-	
	000	I f	hrs	00 000	-	+	-	
	000	I f	hrs	00	-	+	-	
	000	I f	hrs	000	+	-	-	
	5 000	I I	hrs	000	+			

section duration of treatment and the supply of penicillin. The dose given by the interval injection varied between 5 000 and 2 000 Oxford units and the usual dose at the start of treatment was 15 000 units. In severe infec-

tions 25 000 units were given every 2 hours for the first 3 to 6 doses. In those patients receiving penicillin intravenously by continuous drip 50 000 to 80 000 units in 1 000 cubic centimeters of physiological saline solution were

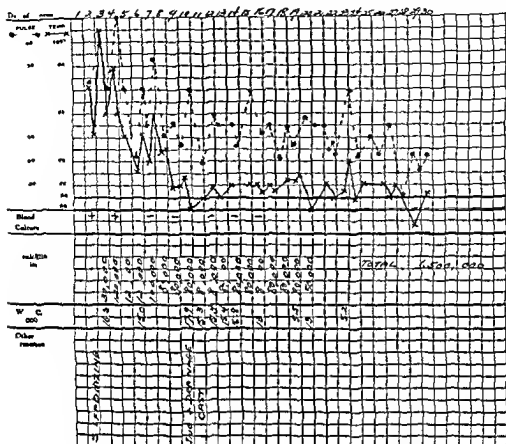


Fig. 1. D. K. M. () A. T. H. T. G. ost. y. l. t. f. l. t. u. () Staphylococcus

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Fig. B. S. Case 7

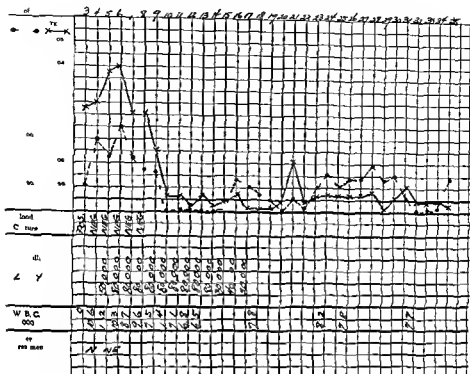


Fig 3 D g () A t h m t g t m y h u f l t f m () Staphylococcus

solution. In 1 case penicillin solution was also injected directly into the pericardial sac after that space had been emptied of its fluid accumulation by aspiration.

Plaster casts were applied in approximately one half of the case for contrast with those treated without immobilization. Twenty five of the patients had received sulfonamide therapy

before penicillin was started and the remainder had not. Penicillin and sulfadiazine were given concurrently in 9 instances.

The case records of 10 illustrative cases of acute hematogenous osteomyelitis of the long bones which were treated with penicillin are reported. They have been grouped for purposes of discussion.



J ly 944 J ly 9 944 A gust 944

Fig 4 W P Case 4

Ca 7 BS 4 ld ht gal as d
mtt d t th Chld n H pta lo ju 5 944
T ow k b f h h d d l p d a b l s t r h t
h l w h b b a m f c t e d d y b f e b
c m p l d f p a t h g h t l g d f Sh was
pl d g l s h d t h p y d was
ll w d t t u h o m T h y m p t m e d
p g t l y q g h d m t t h h o s -
p t l

E m t n b w d d t y s l y l l h t
g l w t h m k d h l g t d r n e a d i c a l h t
h d b l w t h g b t k O t h n i g h t h e e l
t h w a s h l g f c t e d v e s b l

Th wht blood c t was 6500 c ll p cub
m i l l m t w t h 79 p c t p l y m r p h o n e d r l e u
c y t e s T h b l o o d c u l t u w s p o s t f r t h
h m l y t c S t p h y l c o c c u J n e 5 a d

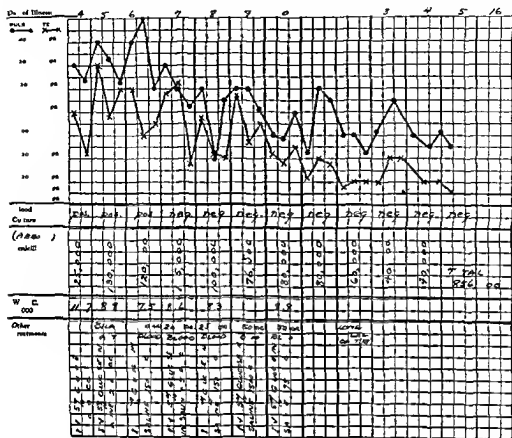


Fig 5 D gnosis () Acute hem t ost my lit (right m distub () St phyllococcus
b t m (3) Staphylococ l p m ni

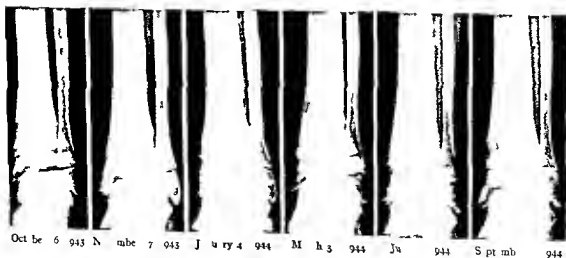


Fig 6 K M Case 4

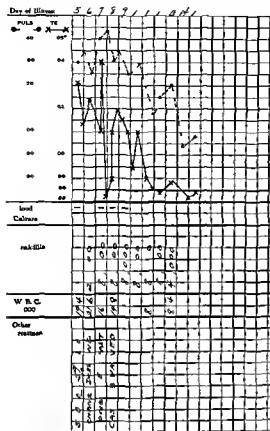


Fig 7 D gn A t h m t t my lu flitb

Th pat t pl d o p c t e l p eul
the apy 500 ts b g g e ry 3 h w t
the b g ing of t tm nt nd ooo ts t th
am int r l at (Fig) \ sm ll f t t
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aspi t d n j 944 Th t v p
c t g th h m ly t c St phyl ccu a
obt ed T o d v l t th ab d
th ll atin i bl m t f m l p
l t u t l d th l g m m b l d plas
t t D a g th c e of l l t t usf
g n d n c t appl i J l
o 944 P r t e n g m h sh
th ck f th p oste m o e th lo e th r d f
th ght f m d upp th d of the b t t
(Fig) Th p t th m d cell t l l
y th t cu c t d t

Cas 4 W P 53 ld wht b y
dm t t d t th G l H p t l J l y 1044
c m pla g f h l h s ght l bow dp
h l f t k e of 3 d y s d t n Abo t th t m th
le on th l b app ar d h e d at d a
j ry of h u left k h c h p d d al m p a d
m d ate l m t at f f l o d t e f th
leg The e had b d b l v of th l f t k f l l

g j ry n 94
E m u n t n sh d d o w y d c t e l y ll
ad l c e t b y h o e t m p at as 3 d
ge F Sw l l g r d t d e s d
c e a s d l l h e t p e n t e th l m
d l i t f th f m p d l m t at f m
to a o c t d w th f f th k A
sm ll p r f i c a l f u d d n g p p e s t
at th r g h t l b w

Th d b l d c t 300 oo cell p eul c
m u l l m t d th h t b l d t 100
th p c t p l y m p l l l c e t e s



Fig 8 M T C 5

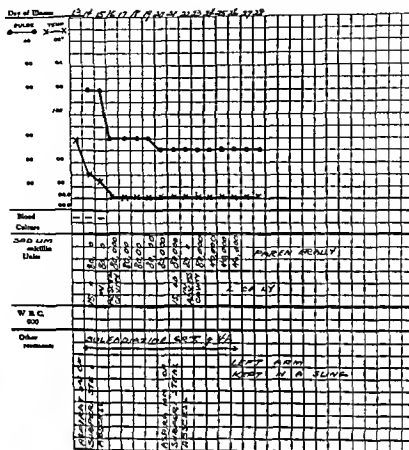


Fig 9 D on s A t h m t g teomy lts f l t h m r u th soft u
bsces

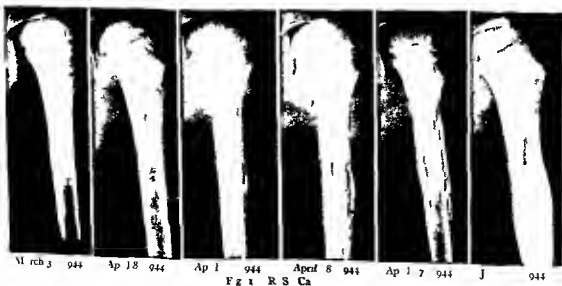


Fig 1 R S Ca

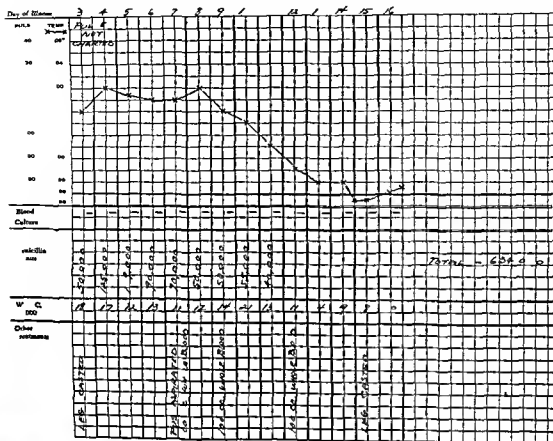


Fig 3 Act h t g t my h t f l t t b d 5 b t

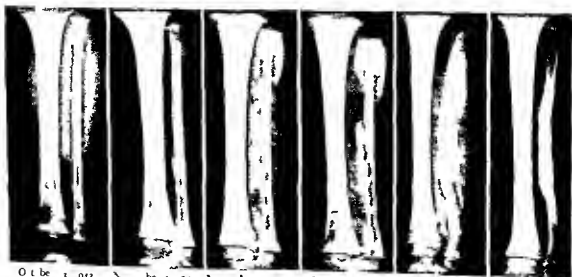
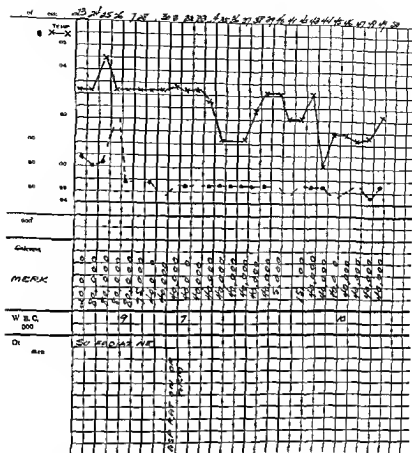


Fig 4 J C C 3



F 5 D on A t h m t t my h t f d d l n a

Cult es f the bl d sh wed m lo of ng S l g th ho p t l h has r m d m
 h m lyt Staph l cc g d h l th d w t h t m pl unt
 Afe hurs ft radm he h d h k g h l CASE 4 K M 3 ld wht by was d
 d th t m p t e to 48 dgr F P n m t t d t th Child H p t al Oct b 6
 l n th apy was ta t d n th th d h p t l d y 943 c m pl g f p h l f t a l l d ght
 o o o t s b g g n t m c l a l v e r y 3 kn Af ru l h d b p e s to th l f t l b
 h r s f / d d 5 o o t s t t h m t e f k F d a b f d m h t d h
 l f m d y (Fg 3) At th s t m th e w l f t l l h l p l y g Th f l l g d v h h d
 g g e t o t g l g c a l d e f e l y t e h k i n g h l f l l d b f a d m l P m
 m y l t f i t h d t l d f i t h f m l m t a p h d w l l d e l p e d t h l f t k l d 4 h
 d 7 d v l t t h t d f o f m d f i n t l t t h m h g e s p p d n t h ght k
 L l t t m t t d o f l t d t f E m t h d a t l y d l y l l
 th l f t h h w t h n t m p t m m b f b v w h t m p t t wa 5 d g r e s F A
 Th temp t e m d l v t d f o 6 hurs l g f r u d a p e s t t h l f t e b o d
 d th n f l l p d l h m l 3 d v l t m p e t h d th t r u k d t m
 D p p f t h f l s f f m m t t M s l e s w h d th g h t b t l g e
 b t l e n d f f m f l l w d t h f l l t m p r a Ab t h l f t n k l d th l h l f f t h l f t
 t L t n t g n g r m h w d m m l e s d l g t h d h t m k d w l l g a d
 a l b o l o n t g o f p t l c t n d q t t d r a e s Th w l m t a t f r o
 a d l g m l l a f d m l t (Fg 4) t n f t h n i g t k t h w l l g d t d r a e
 He was d ch g d h 3 d h p t l d t h t t h f t m d l p e t f t h ght t h g h
 o n m p t m f f c t t h l g A s p c a Th d blood t 4 300 000 c l l p e c u b
 t c r t e b d t d l t ght b a m l l m t d th h t blood t a 7



Fig 6 R. J. C.

ll th 79 pe c t p lymorph nucl a leuc cyt
U l is how d th pr s ce f ceton a d
tra f alb m Bl d c l r e e p s t fo
th h moly t c Staphyl oc ur u R ntg no
gams ugg ted p ost l n v l e m t f lower
t p c t f l f t b a Change p p e fu g
t l d s g t d cute emboli on m t
P n c l l n was tated n the first h pital day
Afte d s of 3 00 u t s he as g n 5 000
t t a v noul e y g h s Th e e n d e
half day lat r th dos w s iuc d t o v s
d 4 d y lat t 500 u t s It as d cont n d
n the th h o p t l d y Bot l g w supp t d
n l n g c a s wh h e b i a l e d There as o
s g a l n e r v t Little r p n to p e c l l r
th py wa e de t f r 7 hours (Fg 5) The t m
pe at e e m a d h g h th blo d l u r s e m a d
p t a d th g of l c a l a m m a t a p r t
t d f l l o w g th th f e r g r a d a l l y f i l l d
ch d q d g e F o t h a t h d v f t r t h s t r t
of p e l l th p y h t r e m d t l t h
7 th h o s p t l d v
O N m b 7 1943 the r ntg og am
sl ed p r o t l l v a t a l g t l m e d a l a s p t
f t h d t l d o f th g b t f m and the l e
th d f t h l i t t l i a H d h g d f m t h
h o s p t l o n N m b e r 4 943 h s 3 t h h o s p t a l
d y i t h d c l d c f a t v n l t o n
O J a v 4 944 th p t l c t n as
m e m k d d a f d c d d t y w r
e n t h r g t f i m u d l f t b (Fg 6)
Th c a t w e m e d th f r t w k M c h
a d h e w l l d t r u m a t t g d l l y
O M a h 3 944 th w n c a d m t l g
a l g t h f m o a l h a f t p m l t the g h t k

a d i the lowe e d of th left tibia but the p r i o
t l r a c t o b d d c e a s d O J e 1944 e a l c
f e a t n was app e t g g t i n g that heal g wa
t a k g p l e The last film o Sept mber 944
h v d f u t h r e l c f i c a t n and i m p r e m e n t i n
l e a m a t n h v e d no a b n o m l i t y

CASE 5 M T 5 y e a l d h t e b y s ad
m i t t e d to th C h i l d e n H s p i t a l o n N v e m b e r 8
943 m p l a u n g o f f p u n n the left n k l f s d y
d a t o n a d f r Th r e d v s l e f o r d m u s u l
f a t h o l the a p h d b t a t e d b y h p h y i i n
E m t i o n h o v d a n a t l y i l l l i t l s
t a b l b o y h s t e m p e r t u w a s 103 2 d g r F
Th e a s n e q u i t l y t e d e r l i n g of the l f t
n k l h c h e v t n d f m t h e t t the p p e r t h i d
f t h l e g A n a c a f f l u c t u t i n n d t e c t e d n the
e g n o f g r t t s w e l l g d t e n d e r

Th e d b l o d c n t w a s 3 750 000 c e l l p r c u b c
m i l l i m e t e r n d t h h m g l o b n d e t e m a t n a s
o g r m s Th h t b l o o d c o u n t a s 12 o c e l l
w t h 80 p e c e n t p l y m o r p h o n u l e a r l c c y t e Th e
n l y s s u t l y n e g a t i v c p t f r t h
p s c f a c e t n B l o o d c u l t u t k n d l y f
5 d a y w l l e p o r t d e g t e
F a c l l n t h p y t a r t d n the d h o s p i t a l
d v o o o o n t s b e g g n t r m c l a r l y v e
3 h u r f 6 d a y O n the 7 t h d y 5000 u n i t w
g n r y 3 h r s D u g t l p e r i o d t h l g a n d
f o o t e s p l i n t d n a S c h a t z d g b t n u
g a l p c d w a s p f o r m d H t m p e a t a r
h i f l l e t n m l b v t h 6 t h h o s p i t l d y (F h 7)
Th 6 2 f f l a m m a t o a b o t h l e f t a n k l e
g d p d l y t h h t e b l o o d u t f l l t o m l
d h r e l p p e a c a d b e h v s g g t d
t h a t the a f t o h a d b e n p r m p t l y c n t l i e d

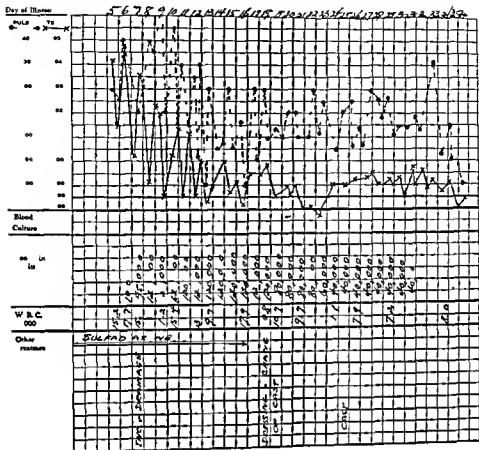


Fig 7 D gn () A t h m t
f l f t k l j t

t my l t f l f t t b d f b l () Py thro

R tgenolog am t n a t t h m e f d m
l h e d o h a g b n o j t f t h l f t
l r leg b t D cemb 943 p n t l t h k
g d e t l g t b l s h a f t (F g 8) Th
p o s t e l t h c k e g h d e r d d t h r w a s
l i g h t d e d t y t h l o r e d f t h
t b j t b e t h p p h v b y D e m b 943
A l g l g a t p p l d D c e m b 5 943
d h s d c h g d d l a t e h 8 t h
p t l d a R e t g g m F e h a r y 943
h d m r o f d s d d t y t h
m t p h y a l r O M V 5 943 r c l f u t
a s d t t g m n t a d t h r w
l c l d f e s d l i f c t n e c p t l i g h t
t f f t h l f t l l O A g u t 5 943 t h
n t g g a m d c a t d t h t h f e c t h a d f
m d e s t a d a d t h t f t h c a l f i c a t f
t h e f i d r h d r r d
C a s R S 8 l d h t h v a d
m t t d t t h C i t G l l o s p t l n V l h
7 944 m p l g f p f l l l g t 5 944 t h
h l d a d l b l l h d h a d t f l c t m

March 3 944 d l d a l t e h d l o p d
p i t h l f t l b d f e e F d y b l
d m w o p n c u d t h e l f t h l d
O n m t h t e m p t u a s 3 d g r e s F
T h e s l e t T h r l d y t l
m m a t t h p E t d g f m t h l f t h l
d t o t h e l b o t h a h t e d d d m t
r h h a s q t l y t e d L m t t n f
m t o f b t h l b a d h l d p e s t
T h h t e b l o o d c t r 8 7 0 0 e l l p c b c
m l m t e t h 8 0 p t p l y m r p h d
l u c y t s T h l y s g t T h t c
d a 3 d p h l f i c c l t t e s t a s t
4 h r s T h B g h t B l o o d c u l t e s
b p h t h d b s q t l p o r t d g a
t a k t h d b s q t l p o r t d g a
t C h e s t o e n t g g r m r e s e t l l e m l
A d i a g o s f h m t c f e m a d d
t t m e t t h a t p t e s a t a d S l i d z
t p y a s t t e d M h 3 944 t h 4 t h d
a f t d m g r m b g g r y 4 h r s
t h u t t i c a b l l c a l m j r e m t O M c h



July 7 1944

July 1944

August 8 1944

September 3 1944

September 3 1944

Fig 8 G C C se 9

1944 the tgen lgt d sbelp r st l
 t bo t th pp r t o th d o th shalt l
 th h m ru th om d m e al zat f the
 d ly g b e R p ted x av ram tons
 h dg d l i c th a cha g s hich ere
 q t t n th 13th h spital d y (Fig 1)
 f s a p at d f m s f t sue ab ce o e th
 pp l tr lap ct f th rm nd the hem ly c
 tept c a cult ed fom it At th m
 a ked t the p t a d it l cted t
 t th ot myel tu p oc th p cell 000
 u ts g e y 3 hours t amu cularly
 (Fig 9) Th f t u b ce as gain a p r at d
 d 5000 t f g e c l l 3 cubic cent m tes
 f l l t a inst l d jnt th b ce sea ty
 W th bus ft the p n c l l n v t a l th
 t m p t f l l to 90 s deg es F a d ther fte
 th l to ce ded Th s bp i teal
 ab c wa p t d t o o c c a a l p cell
 a j t d N g sm cult d f m the
 p t d mat l f r s d v f p cell th ap v
 Th d th n d c d t 5000 n t e r 3
 h rs ft th th d v sp n l n tr tme t a d
 d y l t t w d n t u d
 H d h g d t th Ch l l s C a l e s e e t
 H m h 47th h p t l day d l p
 l v t m t r m l c t i v pos
 bl R t g gr ms take on J 1944
 h d m ked h l g w th i n cal tea
 t n. Aft t a v f 3 m ths t th t t t h
 t ed h m n t l v th ut sym p m
 C E h W S a m th l l h t m f f t
 w adm t t d t th Ch l d H f l l M a c h
 5 1944 th 5 d y h t r y f f e t a b l i t y
 d t h l g b t h l f t h p l t h g

E m to sho d n u r t bl but ot ac t ly
 W i l a t th n ar of d f s u l l g ver th
 l t e al p o t f th left thigh d h p th ind
 t n a d t de es The white bl od count was
 4000 cell th 67 p c n t poly m pho clea
 leuc cyt Ur l y s s as neg ti R n t g o
 g am h ed d f t m t l l g n d decalcification
 of th upp th d f the fur

The p t t a s t ted co s r at ly and 4 days
 afte admi n th of l l g had bec me
 s l c t a t a d th t m p r t u r to 4 degree F
 A i m de l g about 5 cubic centi
 meters of p The p eum c ceus type III v s
 l t u r d l m th bl d s t m a d pus Pen cillin
 therapy as t a t d after n c s on n d d a n age g i
 g 000 u t e v 3 h rs for 3/ days a d 5000
 i t f 3/ day th f r at th ame interval
 The t m p e t fell p r c p t o u ly and th ge eral
 c d t ap d ly m p ed (Fig) The v o u l
 b m clea d the p r u l e t d i g d c ease l
 em k ably H w pla d n Bu k s x t e s i o
 fom M ch 5 1944 t M y 5 1944 A l f t h p
 sp ca as ppl d n M a v 5 1944 a d cha g d
 J e 5 1944 S e f o e t g e gam (Fig 12)
 h d p g e s c destru t n f the upp d f
 th f m r d i g the m th f l l i g adm s i o
 S w k f t d f i t h f g w dent nd as
 t d th m l g th nd calc f i c t n f
 th adja t p p h y Th p e s f h l ng nd
 g th h c t d Whe th cast w em ed
 n S e p t e m b e r 3 1944 th l d n c i o c m
 p l e t y h a l d th fa t m d the l g v y
 l l R o e t g g m s S e p t e m b e r 9 1944 a d
 O c t b 6 1944 h d c m p l t h l g f th
 t myel t p o e s

nfection and 10 weeks before he had had epidemic meningitis from which he had made a complete recovery.

Examination showed an acutely ill white boy whose temperature was 102.2 degrees F. There was a profuse nasal discharge. The left foot was red, hot, tender and swollen to a level above the ankle. A large vesicle containing blood stained fluid was present over the area of greatest swelling.

The white blood count was 15,250 cells with 86 percent polymorphonuclear leukocytes and the red blood count was 3,960,000. Urinalysis showed the presence of albumin and an occasional red blood cell. All blood cultures taken were negative. Roentgenograms showed swelling in the soft tissues but unfortunately they showed only a small portion of the leg.

A paracentesis of the fluid in the large hemorrhagic vesicle was performed and examination of a stained smear of this material showed the presence of numerous small chain linked gram positive cocci. These were interpreted as streptococci and tentative diagnosis of hemolytic streptococcal gangrene was made.

Sulfadiazine 5 grains and an equal amount of calcium gluconate were given every 4 hours. Penicillin was started on the 4th hospital day 10,000 units being given intramuscularly every 3 hours (Fig. 7).

The patient's condition became rapidly worse during the next 24 hours and it became evident that he would die before an additional 24 hours. At this time it was learned that the culture of the vesicle fluid showed the Gram positive cocci to be the hemolytic *Staphylococcus aureus*. Immediate operation was decided upon. On the way to the operating room the child died of convulsions. Under ether anesthesia a long incision was rapidly made through the skin and subcutaneous tissues of the lateral and medial aspects of the leg and foot. A necrotic purulent infection was found in the subcutaneous tissues over the entire leg and dorsum of the foot. On the lower lateral aspect of the leg an area of slough with perforation was found in the fascia. The wound was loosely packed with gauze incorporating four Dakin's tubes and the patient was returned to his room in a very poor condition. He received continuous oxygen therapy via nasal injection of 5 percent glucose in saline solution and several transfusions of 5 cubic centimeters of fresh whole blood. Penicillin therapy was continued giving 15,000 units every 3 hours for the next 12 days and smaller doses at the same interval an additional 13 days.

The fever was striking improvement in his general condition which became evident within the first 4 hours. The condition improved during the following 7 days. The sloughy tissue in the wound became replaced by healthy granulation tissue and the wound gradually healed spontaneously with the exception of a small area 2 centimeters in diameter. The lower lateral aspect of the leg.

Roentgenograms 2 weeks later showed destruction of the distal ends of the tibia

and fibula and involvement of the tibioastragalar joint.

A leg cast was applied on the 21st day after operation and he was discharged on the 47th day. He was able to walk at this time and his general condition was very good. A small sinus tract was present and this could be traced down to the tibioastragalar joint. In October 1944 the patient began active weight bearing after removal of the cast. On November 23, 1944 the wound had completely healed and the patient was without complaint. Progress roentgenograms illustrate the healing which has occurred in the tibia and fibula (Fig. 8).

CASE 6. A 6-year-old white boy was admitted to the Children's Hospital with a complaint of severe pain and swelling in the right leg. He had a history of breathlessness on April 12, 1944, a diagnosis of a cella had been made and 3 days later pain developed in the right knee associated with high fever and local swelling. On April 30, 1944, he had been admitted to the hospital for sulfadiazine therapy was started. When his general condition became progressively worse and the swelling in the leg increased he was transferred to this hospital. On admission the patient was found to be dehydrated, pallid, and cyanotic and dyspneic. White in the blood condition. The oral temperature was 103.4 degrees F. Rales were audible in both lung fields. The right lower leg was dematioid, red, and edematous. Several large areas of fluctuation were present in the involved area.

The white blood count was 37,850 cells per cubic millimeter and urinalysis showed only a faint trace of albumin. The blood urea nitrogen was reported positive. The toxic blood cultures of hemolytic *Staphylococcus aureus* to confirm.

The patient's condition was so desperate that it was obvious he could not withstand anesthesia or operation and drainage of the soft tissue abscesses. Conservative therapy was started consisting of the continued administration of oxygen, injections of 5 percent glucose and saline solutions by continuous drip, and transfusion of 200 cubic centimeters of fresh whole blood. After removal of the plaster splint was applied to the leg for immobilization. Penicillin therapy was started immediately 15,000 units being given intravenously every 4 hours for 4 days and every 3 hours thereafter. He failed to respond to this management and died 17 hours after admission. Permission for autopsy could not be obtained.

RESULTS

It is difficult to assess the value of a chemotherapeutic agent in a disease with both generalized and localized manifestations of infection and to determine accurately the result obtained in each case. Penicillin therapy in some instances of severe advanced hematogenous osteomyelitis with bacteremia sterilized the blood stream, saved the patient's life and

arrested the local infection yet the infection had already produced extensive bone necrosis. The general result obtained in such cases might be considered excellent or good but the severe local destruction of bone produced by the infection principally before the start of treatment with penicillin does not wholly justify this.

The mortality rate in this series was unquestionably lessened. Even though the group contained 3 cases of extensive acute osteomyelitis of the skull and 20 cases complicated by proved bacteremia or septicemia only 1 death occurred. A severe and neglected case of acute hematogenous osteomyelitis of the tibia with staphylococcal bacteremia and pneumonia was admitted to the hospital 14 days after the onset and died 17 hours later.

The results obtained in the cases of acute hematogenous osteomyelitis of the major long bones fell into four groups and varied with duration of disease, the onset and adequacy of penicillin therapy and the severity of the infection.

Group I If the correct diagnosis was made early within the first 3 or 4 days and adequate treatment was started immediately the results were truly excellent (examples Cases 17-4). After a period of 36 to 72 hours the fever, rapid pulse, bacteremia and other general signs of the severe infection began to disappear. At the end of a week the temperature was usually normal and the patient looked and felt quite well. The local signs of infection, such as tenderness, edema and redness, also began to recede after a similar latent period. In this group immobilization by plaster cast seemed to be of comparatively little importance and there was an early return of function. In fact it was practically impossible to keep some children off the involved extremities as early as 2 weeks after the start of treatment. Usually in this group surgical intervention was not necessary and abscess formation did not become evident.

The bone changes as depicted on the roentgenograms were minimal, consisting of localized periosteal reaction or small areas of patchy decalcification of the underlying cortex or both. These findings may be hard to see

and are easily overlooked. An additional 3 cases with typical symptoms and signs of acute osteomyelitis were not included in the report since it was impossible to prove the diagnosis in the absence of roentgenographic findings.

Group II When the diagnosis and treatment with penicillin were moderately delayed the general and local infections were brought under control rather promptly after a period of 2, 3 or more days during which little or no clinical response was evident (examples Cases 4, 5, 21). In this group local soft tissue abscesses occasionally developed but they were usually small. When small they were successfully treated by aspiration and local injection of a solution of penicillin at intervals of 3 or more days. If the abscesses were large surgical drainage by incision was done to minimize further tissue destruction by the accumulated necrotizing bacterial toxins (Case 18). When surgical drainage was instituted the fall in temperature was usually prompt and not delayed for 36 or more hours as in the cases treated without surgical intervention (Fig. 11).

The bony changes developing in these cases were of great interest. Usually no change was visible on the roentgenograms at the beginning of treatment. After a week or more had elapsed periosteal reaction and localized patchy demineralization of the underlying bone became evident and progressively increased in extent and degree, becoming most marked 1 to 3 months after the onset of the infection (Figs. 6, 8, 10, 12). This process previously has been interpreted as representative of further extension of a chronic osteomyelitic process. Recalcification of the demineralized areas followed with re-establishment of a more normal appearance of the bone. Sequestration did not occur in this group.

Group III When the diagnosis and treatment were delayed for 7 to 10 or more days and when the infection was unusually severe, local destruction of bone became very great and soft tissue abscess formation and sequestration occurred in most but not all of the cases. The sequestration however was of limited extent and apparently in some cases the sequestrum acted like an autogenous bone graft.

The local infection was arrested with more difficulty in this type of case and longer periods of treatment with penicillin were usually required. Small abscesses were treated by aspiration and large ones by incision and drainage. Prolonged immobilization by cast in these cases seemed to be definitely indicated.

The bony changes as revealed by serial roentgenograms at the start of penicillin treatment showed extensive bone destruction which increased on subsequent examinations. Sequestration occurred in some instances. In Case 3 the sequestrum was partially discharged spontaneously and in Case 11 the sequestrum is still undisturbed. Small sequestra have apparently been absorbed spontaneously and larger ones possibly have acted as autogenous grafts. These bony changes and results to date are depicted in Figures 16 and 18.

Group II. In certain fulminating infections in which it is apparent that the patient will not live 48 or more hours to permit the maximum effect of penicillin surgical intervention after adequate preoperative preparation is still necessary as an emergency measure. Penicillin therapy is administered preoperatively and postoperatively in doses of at least 15,000 units every 1 to 3 hours. An example of this type is found in case report 29.

DISCUSSION OF THE VALUE OF PENICILLIN THERAPY

The principal bacterial cause of acute osteomyelitis is the hemolytic *Staphylococcus aureus* and less frequent etiologic agents are the nonhemolytic *Staphylococcus hemolyticus*, streptococcus, nonhemolytic streptococcus and the pneumococcus. Since these bacteria are sensitive to the action of penicillin it is not surprising that this chemotherapeutic agent has such a profound effect upon the disease. Sterilization of the blood stream and control of the generalized infection reduce the mortality rate and the incidence of metastatic or secondary infective complications. If metastatic complications such as staphylococcal pneumonia, pleuritis, pericarditis, thrombophlebitis, etc. already exist, penicillin is a powerful chemotherapeutic agent aiding in their control as an adjunct to surgical or conservative treatment as indicated. Thus morbidity is also decreased.

Of particular interest is the control of the localized infection and the resultant roentgenographic changes in the involved bone treated with or without surgery. During the period of penicillin therapy evidence of bone damage was absent or confined to minimal changes such as slight periosteal reaction or small areas of demineralization in the underlying cortex. After the cessation of chemotherapy the periosteal reaction and mottled appearance of the underlying bone progressively increased reaching a maximum 1 to 5 months after the onset of the infection depending upon the severity of infection. In this way the bone always looked worse a month or more after penicillin therapy than during it. This picture has been interpreted as being the result of spontaneous absorption of bone destroyed early in the infection and not as the result of continued destruction of bone by an extending chronic osteomyelitic process. Following this recalcification of the involved areas occurred often very rapidly. Meanwhile normal growth of the metaphyses, calcification of the adjacent epiphyses and early return of function occurred. These facts suggest that adequate penicillin therapy may sterilize the infected bone converting an area of septic necrosis to one of aseptic necrosis. If this is true it will necessitate our re-education in the interpretation of roentgen findings in osteomyelitis.

It has long been known that aseptic absorption of dead bone occurs in transplanted bone grafts (1). When bone is transplanted to another location a considerable part of it dies but those bone cells which are still bathed in lymph and body fluids continue to live and show marked proliferation in the course of a few days. Pervascularization of the necrosed bone is accomplished by new vessels growing into the haversian canals from the surrounding tissues. Proliferating osteoblasts accompany the new vessel, giant cells appear and the dead bone undergoes absorption and conversion into a series of spaces lined by osteoblasts. The formation of new bone is then accomplished by these cells. In this manner the graft becomes partially absorbed and then replaced. We suspect that a similar process occurs in the dead bone in acute osteomyelitis treated adequately with penicillin.

Acute suppuration of adjacent joints subsided rather promptly leaving surprisingly little residual disturbance in the function of the joint.

Sequestration may still occur occasionally in acute osteomyelitis treated with penicillin but only when the disease is unusually severe the diagnosis is delayed or treatment is inadequate. If sequestration does occur further conservative therapy seems indicated. Extrusion of a sequestrum followed by complete healing of the sinus and an excellent result has occurred in this group. Further observations are required to determine the best methods of handling the sequestrum.

It is important to realize that no obvious clinical improvement may be apparent for a period of 48 to 72 or more hours after the onset of penicillin therapy in the patients treated without surgery. This is a very trying period during which considerable pressure may be brought to bear upon the surgeon by the pediatricians, internists or other surgical consultants in favor of immediate surgical intervention. Very close observation is required and a decision to operate may become necessary if the infection becomes so severe that the patient will not survive the 48 or more hours necessary for full penicillin effect. In the majority of instances however complicating or metastatic infections should be looked for if a sharp fall in temperature and marked clinical improvement do not occur at the end of this latent period. In the cases with large abscess treated by incision and drainage and penicillin the clinical response in this series was immediate.

Although this is only a preliminary report there seems to be little doubt that early and adequate penicillin therapy can eliminate the necessity of surgical intervention in cases of acute osteomyelitis. In the past there has usually occurred a considerable degree of secondary contamination of areas of osteomyelitis treated by surgical drainage. Devitalized tissue exposed to the air invites mixed or saprophytic infection particularly by various gram negative bacilli and it is often difficult to prevent this type of secondary infection. Secondary invaders have frequently been resistant to penicillin or even destructive to penicillin.

The elimination of this complication by penicillin therapy without surgery may be a very important factor in the arrest of the local infective process and the spontaneous absorption of devitalized bone.

Throughout the study and particularly at the start it took great fortitude to refrain from surgical drainage in individual cases as advised and even insisted upon by associated pediatricians, internists or consultant surgeons. In some instances surgeons unfamiliar with the action of penicillin were unwilling to complete the conservative treatment and performed local surgical drainage when we believed it was unnecessary. Later in the course of the disease when the roentgenological appearance of the bone became so bad it again became difficult to withhold surgery in face of reports that extension of the destructive chronic osteomyelitic process had occurred.

Since the local process in the bone is essentially one of diffusing infection characterized by purulent exudation, thrombosis of adjacent blood vessels and necrosis, the death of bone may become extensive if the infection is unrecognized or unchecked. In penicillin there is now available a chemotherapeutic agent which can check the infection and even permit spontaneous resolution of the osteomyelitic process. It is apparent therefore that early diagnosis and early intensive penicillin therapy are extremely important if the destruction of bone is to be minimized. It must be emphasized that early diagnosis can only be made on clinical ground and little or no help is to be expected from the roentgenograms for 10 or more days. If there is any doubt as to the presence of an acute osteomyelitis it is better to start penicillin therapy rather than wait until the diagnosis is proven.

The results obtained in some of these patients treated without immobilization were so good and recalcification was so rapid that the question of the value of immobilization by cast or splint should be studied further when penicillin is used.

SUMMARY

During the past 21 months 34 cases of acute osteomyelitis in which patients were treated with penicillin have been studied and a pre-

liminary report of the results has been presented. If the diagnosis was made early and penicillin treatment instituted promptly without surgical drainage, both the general and local infections were brought under control so thoroughly that a minimal amount of residual bony damage resulted. Moderate delay in diagnosis and treatment increased the extent of bony damage, but the infection was nevertheless quickly arrested without the aid of drainage and without sequestration. If small localized abscesses developed, they were treated very satisfactorily by aspiration followed by injection of a solution of penicillin. If large abscesses developed, prompt drainage by surgical incision was required. Delay in diagnosis and treatment not only increased the degree of bony damage, but favored the development of large abscesses, sequestra, and metastatic visceral infections.

A period of 36 or more hours after onset of penicillin therapy usually occurred before the

beginning of definite clinical improvement even in the cases diagnosed early. Occasionally cases of acute osteomyelitis are seen which are so fulminating that they will not survive the 48 or more hours necessary for the full effect of penicillin. Such cases must be recognized early during penicillin therapy and subjected promptly to the surgical procedure indicated.

Penicillin is a powerful and effective chemotherapeutic agent in the treatment of acute osteomyelitis. When administered early and in adequate amounts, it reduces the mortality and morbidity, brings the infection under control, minimizes local destruction of bone and resultant deformities, permits spontaneous removal of necrosed bone and healing, and makes possible early return of normal or nearly normal function.

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THE TREATMENT OF INTRATHORACIC WOUNDS

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DURING the first year of our participation in this war the treatment of intrathoracic wounds was the subject of much theoretical conjecture since we had only the rather meager experience of World War I upon which to base opinions. In those years which have come between these two wars knowledge of pulmonary physiology and pathology has greatly increased. This knowledge coupled with proper anesthesia has made possible the safe performance of intrathoracic operations. Whereas such procedures were rare and accompanied by a high fatality rate previous to 1917 they now are commonplace and readily accepted surgical procedures. For these reasons it might be expected that thoracic wounds would be better cared for and that in the end the results would reflect these surgical improvements.

We have now been at war 2½ years during which time we have engaged in several campaigns in a number of theaters. A large number of thoracic wounds have occurred but only recently have large numbers of this type of injury been seen and treated by individual groups. Thus sufficient statistics are now available to be of use in formulating some definite ideas on the proper management of such cases.

In order to understand well the opinions to be presented herein it is necessary to be somewhat familiar with the train of evacuation. In this theater surgery is done in one of three types of hospitals. The most forward of these is the field hospital which as a rule is set up beside the medical clearing station. Here auxiliary surgical teams work, and to these installations go the abdominal wounds, the severe chest wounds, and the traumatic amputations. Further to the rear are the evacuation hospitals which handle only recent casualties and still further back the general hospitals where surgery of a more definite nature is done.

A system of triage has been set up so that certain types of wounds go to specified general hospital. Such a system makes possible the evaluation of treatment and takes advantage of surgical specialists whom certain hospitals may have on their staffs.

This study is based on 320 cases of penetrating or perforating thoracic wounds seen during the winter and spring of 1944. The study has been divided into two groups, namely those patients who have had a thoracotomy done in a forward installation for the purpose of debriding the intrathoracic wound and a second group of patients who have been treated by conservative and supportive measures in the forward area and were evacuated to a rear echelon hospital for whatever surgery of a more formal nature may have seemed needed. The first group contains 127 patients, the second is composed of 193 cases.

By this method of grouping, an attempt has been made to evaluate the merits of treatment in both echelons. Furthermore a study of these statistics should give some idea as to when and where formal procedures should be done to give the highest percentage of good results with the least morbidity and fatality.

Debridement of the chest wall wound and closure of the sucking wound are accepted surgical procedures. The larger question is when should the debridement be carried to the intrathoracic area and in which of these instances is it necessary to perform an early thoracotomy. Injuries to the contents of the pleural cavity which have been used as an indication for performing intrathoracic debridement are listed and will be taken up separately to determine whether or not they constitute an indication.

1 Wounds of the lower chest with possible injury to diaphragm and peritoneal contents

2 Foreign body either metallic or bone fragments

- 3 Wounds of the mediastinum
- 4 Hemothorax
- 5 Tension pneumothorax
- 6 Hematoma of the lung

WOUNDS OF THE LOWER CHEST WITH INJURY TO THE DIAPHRAGM

There can be little question but that such wounds should be actively debrided and the debridement carried into the pleural space to determine the exact extent of the injury. There were 51 wounds of the diaphragm in this study. Forty nine of these patients had had a thoracotomy done in a forward installation with repair of the diaphragm. In 2 instances wounds of the diaphragm were overlooked. They were both on the right and there were accompanying wounds of the liver. Each of these patients developed a biliary pleural fistula with subsequent infection of a large overlying hemothorax. Bronchial fistulas were also present. Decortication of the lung with closure of the bronchial fistulas was done in each. In one an excellent result with complete expansion of the lung and removal of the tubes in 10 days was accomplished. In the other the bronchial fistula reopened, the lung collapsed and a chronic empyema must be accepted.

The remaining 49 patients did extremely well when the gravity of these wounds is considered. As may be seen by examining Table I there were 10 wounds of the spleen requiring splenectomy and 4 wounds of the bowel which

were closed through the diaphragm. There were 14 instances of liver injury. In 1 patient the left kidney was injured and was removed through the diaphragmatic opening.

The ultimate results can be seen also in Table I. Twenty seven cases or 55.1 per cent could be called good results, the lung had expanded well leaving a relatively normal appearing chest. Six patients or 12.3 per cent had a fair result and in 16 or 31.6 per cent the outcome was poor. These 16 patients were operated upon for the second time to correct difficulties which arose following the first operation. Thirteen patients in this latter group developed empyemas, 6 who were considered to have an infected organizing hemothorax were treated by decorticating the lung, 7 were treated by rib resection and drainage of the empyema. One nonpurulent organizing hemothorax was decorticated. The remaining 2 patients had lungs which would not re-expand and a secondary thoracotomy with lysis of constricting fibrous bands was necessary. The empyemas were healed or healing when the patients were evacuated and it is believed that none will require further surgery.

Those classified as fair results were so called because of a moderate amount of pleural obscuration in the lower chest but it was felt that they could not be improved by further surgery.

There were no deaths although 3 patients had severe liver wounds. Each became deeply icteric and 1 had 4 severe hemorrhages from the liver before we were finally able to find the bleeding vessel and ligate it.

The spleen is readily removed through the diaphragm. In fact it is much more easily removed through the transdiaphragmatic approach than through an abdominal incision. It seems that in civil practice this approach may have distinct merit in the removal of the traumatized spleen as it obviates the dangers of a postoperative abdominal hernia and has the advantage of a much more complete exposure of the vessels. Furthermore individuals with a normal chest so operated upon can be out of bed in 4 to 5 days.

Left thoracoabdominal wounds did better than those on the right probably because of the complicating liver wound. A common

TABLE I—AN ANALYSIS OF 51 THORACOABDOMINAL WOUNDS

T me l und	N ves	F re ge	Res l t m		
			Res l	N es	P
Trea d b ho ac m		06	Good		
L ed (l)			F	6	
Wound l lee		6	Poo		
l und li			F b rery d ne		
W d f bowel		4			
l d l k d ey					

l ve t m d arou h d b m
f Bow l re pa red thro u b d h ra m
k d a (l l) thro u g d i b ra g m

cause of trouble in right sided wounds was neglecting to drain below the diaphragm after the repair had been done. If any suggestion could be made in the care of this type of wound it would be that whenever the liver is damaged the subphrenic space must be drained. This drainage we feel would obviate many of the difficulties encountered both above and below the diaphragm.

Early treatment by thoracotomy of the thoracoabdominal wound is imperative. One has only to witness the extensive complications which develop when these wounds are left uncared for to become cognizant of this point. It is extremely gratifying to see from these figures that of 51 such wounds only 2 were overlooked. Exploration is a sound policy whenever the course of the missile has been such that there is a possibility of injury of the diaphragm. Even though exploration may be carried out in the occasional case in which no diaphragmatic injury is present, still this procedure will save many individuals long periods of convalescence and in some instances their life.

METALLIC OR BONE FRAGMENT FOREIGN BODIES

There has been considerable discussion relative to the removal of intrapulmonary foreign bodies. During the African and Sicilian campaigns and for several months early in the Italian campaign a size limit of 7 millimeters was set as the criterion for removal. Naturally the location of the foreign body was an important factor when removal was considered. As time has progressed the limits of size were increased and at present only foreign bodies which exceed 1.5 centimeters are removed unless even though smaller their location makes their presence a menace to the host.

Some believe that a foreign body in the pleural space may be more hazardous to the host than one within the lung. In this series we have seen only 1 intrapleural metallic foreign body which was associated with an empyema. Apparently the fear is more theoretical than real. There was a tendency early in the campaign to remove metallic fragments from the lung in the forward installations. As time went on such practices were discouraged

for it was evident that no harm resulted from their temporary retention. Although foreign bodies are often surrounded by a hematoma of varying size into which have been carried fragments of clothing and other foreign substances, in no instances have we seen a lung abscess develop nor do any of the authors have knowledge of such a happening.

In 26 patients in this study metallic foreign bodies were removed in forward hospitals by the performance of a thoracotomy. As nearly as can be told from records, which in a few instances due to the tactical situation were inadequate, the presence of the foreign body was the only indication for thoracotomy. In this group there were 8 poor results or 30.7 per cent.

In the total series of 320 patients admitted with penetrating or perforating chest wounds to our hospital there were 68 cases in which foreign bodies were present. In 2 the foreign bodies were considered too small to remove; in 2 instances patients having sizeable metallic foreign bodies were too ill from other wounds to consider removal and were sent to the zone of the interior with a foreign body retained. Forty-four patients had retained metallic fragments of a size which justified removal. Thirty-six of these had only a foreign body as an indication for surgery and were for purposes of comparison quite comparable to the group thoracotomized in forward hospital. In this group the only postoperative complication was 1 empyema or a poor result per centage of 7 per cent. In the remaining 8 cases the presence of the foreign body was not the only indication for thoracotomy. In 3 instances an organizing hemothorax was present and in 1 case the foreign body was complicated by an empyema. The 7 patients were treated by decorticating the lung with a good result in each instance. The 1 patient who had an empyema was treated with a rib resection and drainage and the foreign body was removed from the pleural cavity. The empyema healed and the soldier returned to limited duty.

It becomes plain from this tabulation of results that the presence of a metallic intrathoracic foreign body is not necessarily an indication for early surgery. It seems that

removal soon after wounding is accompanied by a certain degree of risk. When the poor results which ran to 30.7 per cent following early removal are compared with those of 2.7 per cent attained in cases in which a late and more elective thoracotomy was done it becomes clear that early removal is unjustified.

Bone fragments are not infrequently driven into the lung when a rib or scapula is comminuted in the process of wounding. Such fragments constituted an indication for early thoracotomy in 11 cases. The results were good in 7 instances and poor in 4. The reasons for classifying these 4 as poor results were as follows. In 1 instance an anterior thoracotomy had been done at the site of the wound exit. The wound of entrance which had fractured the scapula was not debrided. Four days later a subscapular abscess was drained. On admission to our service a lung abscess was present. At operation a long fragment of bone was found extending from the subscapular abscess to the one within the lung. We were of the opinion that the infection had traveled from beneath the scapula along the bone fragment to the lung where it had infected a hematoma. Two patients still had numerous bone fragments within the lung despite a thoracotomy for their removal. These cases were observed for some time and no trouble was seen to come from the presence of the fragments. The fourth case had an empyema with a large bronchial fistula. The lung was decorticated and the fistula closed. The ultimate result was classified as fair for while the empyema healed there was still a relatively large amount of dysfunction of the affected side.

Five times bone fragments were known to be present in patients who came to us without forward débridement of a formal nature. In 1 patient they were seen on the x-ray film and were left alone as there seemed to be no indication for their removal. In 4 patients they were an incidental finding at operation and subsequent review of the x-ray films failed to establish their presence. In 2 of these 4 cases a large bronchial fistula with an empyema was present and the bone fragment was found lying in the lung laceration. Whether its presence was the chief factor in establishment of the fistula cannot be said. It is conceivable

that when the fragment was set in motion by the wounding agent it could have badly lacerated the lung; however it is equally true that the impact of the missile alone was sufficient to tear the lung parenchyma.

Certainly the case against early removal of bone fragments is not as strong as in the case of the metallic foreign body. There is some evidence to show that they may cause trouble of a serious nature. The neurosurgeons have considered them more dangerous from the standpoint of subsequent brain abscess formation than the metallic foreign body. However the comparison is not entirely valid for the reparative properties of lung and brain tissue are entirely different. We feel that there are two reasons for avoiding a forward thoracotomy in these individuals. The first is that bone fragments are often exceedingly hard to find in a badly wounded lung when the hematoma is still present and the second is that early thoracotomy carries a higher percentage of poor results than those performed at a later period. A larger series of cases is needed to establish a policy consistent with good surgical principles.

WOUNDS OF THE MEDIASTINUM, HEART AND PERICARDIUM

The number of patients with wounds of this nature seen alive is by reason of their location relatively small. Seventeen such cases have been seen. Nine had had an early thoracotomy done. Of these 3 had wounds which had lacerated the pericardium. There was 1 stab wound of the heart with a cardiac tamponade which was repaired; the patient subsequently developed a purulent pericarditis which was drained and he made an uneventful recovery. In another patient the heart which had been lacerated by a piece of shell fragment was sutured and recovery was uneventful. Four times the mediastinum was wounded without injury to any important structures in patients the missile traversed the mediastinum and came to rest in the opposite lung from which it was subsequently removed. In 3 patients in this group there was electrocardiographic evidence of myocardial damage. The results which were obtained in these 9 cases were all good.

Eight patients were admitted to the hospital with foreign bodies in the mediastinum or pericardium. There were 3 instances of pericardial foreign body in the fragments were removed in 1 the missile was extremely small and was left in place. Five patients had mediastinal foreign bodies of varying size. One which was extremely small was not touched. The remaining 4 were operated upon. The foreign bodies were found in 3 in 1 the missile was never located. The postoperative course was uneventful in each case.

Early thoracotomy should undoubtedly be done in those cases in which the posterior mediastinum has been wounded because of the possibility of esophageal injury. For practical purposes the esophagus is the only important mediastinal structure the wounding of which if not followed by early repair may give serious results.

It would seem relatively safe to leave fragments in the anterior mediastinum for subsequent removal. Pericardial lacerations should be repaired but it is often difficult to tell just when the pericardium has suffered. Cardiac tamponade resulting from cardiac laceration requires immediate surgery.

In wound of the mediastinum as in those of the diaphragm the wound of entrance and the course of the missile will have much to do with determining whether early surgery should or should not be done. If there is any question as to the possible damage to important structures early surgery is the only course in keeping with good practice.

HEMOTHORAX

Hemothorax is seen in a large percentage of chest wounds. In civil practice there have been two schools of thought namely those who did nothing with the blood within the pleural space and those who felt it should be removed by aspiration. From reports of these two methods of treatment the results seen ed always good. It is true that patients seen in civil life by the authors and treated by aspiration alone did well and thoracotomy in such individuals was rarely done. When a piration was done and the blood was removed the lung promptly expanded. The presence of residual obscuration of the lung on x ray

examination was rare and recovery was almost invariably rapid and complete. This has not been true in all cases of hemothorax seen here. Often within a few hours after wounding it was impossible to obtain any blood from the pleural space despite x ray evidence of fluid. The answer was that the blood had already clotted. Such a situation led to the performance of early thoracotomy to remove the clot and suture the bleeding lung for it was felt that early removal of the clot would speed recovery. As time went on it was realized that so simple a solution was not the answer to a problem which constantly gathered to itself more complications.

In this study there were 31 early thoracotomies done for hemothorax alone. The blood within the pleural space was not clotted in all instances. From this number of thoracotomies only 10 or 32 per cent could be called good results of the remainder 3 or 9.8 per cent were considered fair results and 18 or 58.0 per cent were definitely poor.

The 3 cases classified as fair were so called because of moderate pleural obscuration by x ray examination. There is some question now on reviewing these films as to whether subsequent surgery should not have been done in 1 of these but our early opinion was that the lesion would clear. This it did moderately well however we feel now that in the present state of our knowledge of such things the lung should have been decorticated.

The 18 cases tabulated as poor results were so classified because of the following reasons. Fourteen patients subsequently developed empyema. Seven of these were treated by decorticating the lung on the involved side. 7 had a rib resection with drainage of the pleural cavity. Most of these who were treated by drainage alone would now be decorticated because they represented infected organizing hemothoraces however they were seen early in our experience they were localized empyemas and it was felt safer to treat them by simple drainage. Three patients who had an organizing hemothorax were operated upon and the lung on the involved sides were decorticated. One patient had an organizing hemothorax of a mild degree and because of other wounds which complicated the situation no further

surgery was considered wise. His course was afebrile and the need for immediate surgery was not considered urgent.

Eight of the 17 patients operated upon had completely expanded lungs at the time of discharge. Nine still had an empyema tube in the pleural cavity. Two of these 9 had a large bronchial fistula in a small empyema pocket. They will probably need further surgery. The remaining 7 had small empyema pockets which were obliterating.

One hundred and nineteen patients with hemothorax who had had no previous treatment other than debridement of the chest wall wound and aspiration of the pleural cavity were admitted to our service. Seventy six or 63.8 per cent of the group cleared completely or almost so by aspiration alone. Four patients who had a moderate amount of pleural exudate but not enough to require further surgery were called fair results. Thirty nine or 32.9 per cent failed to clear. In some of these aspiration had never been possible and in others it was possible to obtain fluid early while later attempts at aspiration gave negative results despite evidence of fluid by x-ray examination. Nineteen of the 39 cases of organizing hemothorax were grossly infected and must be considered empyemas.

The 39 patients who failed to clear by aspiration alone were subjected to further surgery. In 30 instances the lung was decorticated. 10 patients in this group had gross evidence of infection at the time of surgery. The remaining 9 cases were treated by rib resection and drainage of an empyema. Twenty seven of the 30 patients whose lung on the affected side was decorticated obtained good results. 3 had a poor result. Two of the group will have a chronic empyema and will need further surgery. 1 has an empyema which is slowly expanding and because of the progress made under our observation we feel the lung will completely expand. In 9 instances in which a frank empyema was present and rib resection with drainage was the procedure used good results with the complete expansion of the lung were obtained in 7. One patient had a large bronchial fistula and will require further surgery. The remaining patient had an empyema which was diminishing

rapidly in size when he developed a brain abscess approximately 3 weeks after drainage and died.

The question may arise in the minds of some as to when simple drainage of an empyema is resorted to and when the lung is decorticated. This subject will be discussed more fully in a subsequent communication. To state the problem briefly we have decorticated those who had evidence of an organizing hemothorax which was known to be partially infected but in which liquefaction of the clot was proceeding slowly. We have drained those who had a small localized empyema in which we felt that the lung was expansible and the fibrin peel had been completely liquefied. With the advent of penicillin as an adjunct to surgery and a better knowledge of the surgery involved decortication is considered a more useful procedure than open drainage in such cases for it allows the patient to have an expanded lung more quickly, it obviates the wearing of an empyema tube for a long period of time and reduces the incidence of chronic empyema.

To summarize these cases it will be seen that of 119 patients with hemothorax who were not thoracotomized early 110 or 92.4 per cent had a good result, 4 were classified as fair, 4 as poor and 1 died. These figures should be compared with the results obtained in the group who had an early thoracotomy for hemothorax where the percentage of good results was 32.2 per cent and the poor results ran to 58 per cent. There were 19 empyemas in a group of 119 patients treated conservatively early as compared with 14 empyemas in 31 patients who had an early thoracotomy.

It may be said that these two groups are not entirely comparable and that is granted. However if the 39 patients who ultimately came to surgery late are compared with the 31 who had early thoracotomy the comparison is still striking: the good result percentage in the first group being 87.1 per cent as compared with 32.2 per cent in the latter. Furthermore 17 of the latter group subsequently underwent further surgery for either an empyema or an organizing hemothorax.

The argument has been raised that thoracotomy has been done early to stop lung

bleeding Lung bleeding is a transitory thing as is evidenced by the fact that in only 1 case of 17 upon whom forward thoracotomy was done was a bleeding lung seen. With the collapse of the lung which comes as the hemothorax increases the bleeding stops. Intercostal vessels have been seen to bleed more often than the lung but these can be controlled in the original debridement by removal of a small segment of rib and ligation of the vessel. The pleural cavity need not be violated.

There can be no question but that hemothorax as we see it here presents an entirely different picture from that seen in civil practice. The method of wounding is of course different. In civilian experience the wounding agent is as a rule a pistol or rifle bullet of small caliber or a sharp weapon of small size. The majority of these wounds discussed here were produced by shell fragments which have rough edges which whirl in their passage and do great trauma to the tissues through which they pass. It is not uncommon in these wounds to see the tissues contused and bleeding for some distance from the path of the missile. Severe hemothorax has been seen in instances in which the wounding missile never entered the pleural space. The dissimilarity in the wounding agents may account for the difference in the behavior of hemothorax here and at home. While there still may exist doubts in the minds of some as to the cause there is no question that a marked difference exists. From our figures it seems evident that approximately 30 per cent of hemothoraces treated conservatively will need subsequent surgery. However there is little question but that such a method of treatment gives infinitely better results than can be obtained by early thoracotomy.

TENSION PNEUMOTHORAX

Strangely enough pneumothorax of a tension type has not been a serious complication in these wounds. Tension pneumothorax can arise in two ways from an external wound which sucks air in but will not release it or from a lung wound which pumps air into a pleural cavity from which there is no avenue of escape. In talking to recipients of these wounds it is clear that the average soldier as

soon as he hears the wound suck applies pressure with his hand or lies on the wound until the aid man who promptly applies a pressure dressing arrives. These two things have tended greatly to obviate the dangers of the sucking wound. Tension pneumothorax from the wounded lung has not been common. When seen it has been treated early by aspiration. If this has failed to keep up with the air escape a catheter is placed in the chest at the field hospital. In only 2 instances was an early thoracotomy done to close what was apparently a large lung laceration with tension pneumothorax. In both instances catheter water seal drainage had not controlled the pneumothorax. Such a procedure seems entirely justified in a wound in which catheter drainage after a reasonable length of time has not brought about lung expansion.

Subcutaneous emphysema which has been the nightmare of older surgeons engaged in treating the wounded has been seen only rarely in a degree to which it presented a problem. There is often a small amount of air in the tissues about the wound but in only 1 case in this series did an emphysema of a serious nature develop. Why have these two conditions namely tension pneumothorax and extreme degrees of subcutaneous emphysema which we worried greatly about during those days when we were preparing for combat turned out to be of such minor importance? It seems that the establishment of the hemothorax with a small amount of pneumothorax quickly collapses the lung with the result that both bleeding and air escape cease. These lungs collapse quickly and uniformly because there are no adhesions to hold them to the chest wall. By such a mechanism the wounds are quickly sealed. It must be remembered that we are dealing with young individuals who have been carefully screened by history and by physical and by x-ray examination to rule out pulmonary disease. This explanation is also not entirely theoretical for in over 200 thoracotomies which are included in this series in only 3 cases were adhesions present which bound the lung to the chest wall. Furthermore x-ray films taken soon after wounding show that adhesions are only rarely present. It may therefore be said that x-ray

TABLE II—TOTAL RESULTS FORWARD THORACOTOMY

	Good		F		Poor		T	F h N
	N	P	N	P	N	P		
W d ds phr gm	7	55	6	3	6	3 6	9	6
F gn bodi	7	65		3 6	8	3 7	26	8
H m thora				8	5	3 5	3	3
Bon fragmen		6 6			3	3		
Ten m h						5		
W d medu m	4	75				5	8	3
T	6							

screening on induction has played a part unthought of at the time of its inception

HEMATOMA OF THE LUNG

Hematomas of the lung may result from wounds of the lung or from the contusion which occurs when the chest wall is wounded without pleural penetration. We have seen 1 hematoma which involved over three fourths of the upper lobe result from a wound which transected the spinal cord and lacerated through the shoulder girdle on its way out. There was no pleural penetration.

Hematoma has presented no problem. As a rule they clear almost completely in from 1 to 4 weeks depending on their size. On 3 occasions we have seen the hematoma break down and leave a round cyst like cavity which upon further observations closed leaving a normal appearing lung. One of these patients had a fluid level and coughed up old blood for some days the temperature remained normal and recovery was complete. Purely on the basis of theory one might expect abscesses to develop in these ideal sites. We have seen but 1 case in which an abscess developed and this we feel was infected from a bone fragment which communicated the hematoma with an extra pleural abscess.

Large metallic foreign bodies have been seen lying in the center of hematomas and have caused no trouble. We have come to feel that it is best to let the hematoma resolve before removing the foreign body the reason for this belief being that it would be necessary to evacuate the hematoma to remove the missile. Such a procedure leaves a large defect in the lung which must be closed by wedge resection.

Early in our experience such problems were encountered. If the hematoma is allowed to resolve the foreign body can be removed by simply incising the lung. It is then removed through normal tissue which can be closed with a few fine silk sutures. It is remarkable to see how normal these lungs are a few weeks after wounding.

The lung has remarkable ability to heal. We have seen lungs which aside from an organizing hemothorax were otherwise normal which only a few weeks previous had been so badly contused that the surgeon had considered lobectomy. It is important to remember that a lung which a few hours after wounding may appear hopelessly damaged will be almost normal in appearance a few weeks later.

DISCUSSION

We wish to make clear that the comparison of the results of forward installations with our own is in no way an attempt to depreciate the work of those who see these injuries early. It is rather an attempt to learn what is best treated early and what is better treated late. The problems met here have not been met before and it is only by such candid analysis of failure and success that we can come to conclusions which will aid our efforts.

In all 17 patients with thoracotomies done early have been compared with 193 treated conservatively early definitive treatment being left until later. The results of the first series are as follows: 63 cases or 54.3 per cent are to be considered good results regardless of the indication for which they were done; 17 or 7.9 per cent were fair results and 48 or 27.8 per cent were poor. It was necessary to do opera-

tions of a secondary nature in 48 of the 127 patients mentioned. This figure represents 27.8 per cent of the total. Seventeen empyemas were drained. 1 lung was decorticated for an organizing hemothorax with or without an associated empyema. 3 foreign bodies were removed and 1 lung abscess was drained. Five patients had a lung which would not expand and needed a subsequent thoracotomy with lysis of adhesions to aid re-expansion. One large chest wall defect was closed.

These results can be compared with those obtained in 84 thoracotomies done on this service in 1944 of which the operative procedure was their second thoracotomy. There were in this group 66 good results or 78.5 per cent, 12 or 14.2 per cent fair results and 6 or 7.5 per cent poor results.

It becomes evident from these figures that early thoracotomy does not give the good results which can be expected from thoracotomy done late even at times for complications which were more serious than the original wound. It has been the experience of those in this theater that early thoracotomy will at best give about 50 per cent good results.

There are certain reasons for this, some of which are avoidable and others not. It seems to us that most of the poor outcomes encountered can be attributed to failure of the lung to expand on the side operated upon. One as a rule has little trouble with subsequent empyema following surgery if the lung rapidly expands to fill the pleural space.

These thoracotomies were done in many instances on badly wounded lungs. In such cases a hematoma may be present and the lung may show other pathologic states such as edema and patchy atelectasis. Such states prevent proper expansion of the lung. Numerous fine moist rales and rhonchi are a common finding in these individuals. This condition has been called wet lung of trauma. Great care has been taken by our forward surgeons to perform bronchoscopies after all thoracotomies but bronchoscopy while a definite help clears only the large airway obstruction. Therefore a situation arises for which little can be done except to avoid thoracotomy in any case in which it is not a necessity to preserve life and lessen later complications.

Hemothorax develops early and is often clotted at the time surgery is done. There is already a fine film of fibrin deposited on the lung surface which definitely impedes expansion. When this lacework of fibrin has been deposited it is almost impossible to remove it at this early stage. Thus the lung expands poorly because of the fact that it is wet and as it dries it is held in the unexpanded state by a coat of fibrin which gradually becomes heavier.

There is still another factor that may have some bearing on the behavior of some of these patients. The large majority of these cases were seen during the winter of 1944. It was cold along the Rapido and before Cassino rain fell frequently in the low lands and in the mountains which flanked the valleys snow fell. There was little shelter, many of the troops had respiratory infections. Evacuation was difficult because of the terrain and wounded men often lay for long periods before they could be removed. This combination certainly increased the hazards of a wet lung or laid the groundwork for it.

There have long been two schools of thought as to the advantage of draining the pleural cavity after surgery. We were impressed with the frequency with which the thoracotomies were closed without drainage. To us it had always seemed that water seal drainage for a period of 48 to 72 hours after intrathoracic surgery had distinct advantages. In this group no drainage was used in 37 cases. A comparison of the good and poor results from the drainage standpoint is enlightening. In 90 patients who had thoracotomy and were drained the results were good in 60 per cent of the cases. Whereas in 37 cases in which drainage was not done the results were good in only 35.1 per cent. Such results lend credence to the belief of a large number of thoracic surgeons that drainage of the pleural cavity after intrathoracic surgical procedures has virtue. This fact it seems is doubly true in these types of injury in which rapid lung expansion is a prime factor in the avoidance of empyema.

There were 54 patients in the entire series of 320 who developed an empyema or an incidence of 16.8 per cent. Empyema occurred in 34 of the 127 patients who had early

thoracotomy or 63 per cent. There were 20 cases of empyema in 193 patients treated conservatively early. The incidence of empyema in these patients who had an early thoracotomy done is lower than has been the experience of some other groups in this area. The reason for this we do not know unless it be that when an organizing hemothorax was present we adopted a policy of early decortication of the lung. Early in the Tunisian and Sicilian campaigns it was not uncommon to see in individuals who had an organizing hemothorax develop empyema in from 6 to 8 weeks after wounding. It is our experience that a very high percentage of organizing hemothoraces are infected as demonstrated by positive cultures of the peel even though the clinical course would belie it. Thus early removal of the peel may have obviated the development of an empyema in a number of our cases. We have adopted a policy of decorticating these lungs from 3 to 4 weeks after wounding. Earlier attempts find the peel too friable to be consistent with good removal.

There were 6 patients in the entire series who we believe will need further surgery to restore them to normal beings. Four of these have unclosed bronchial fistulas, 2 have a moderately large chronic empyema. Empyemas which have developed on the basis of an infected hemothorax in our experience and in that of others have often become chronic. Decortication of the lung in these cases has been of great aid in preventing the occurrence of chronic empyema. Sixty one of the total series returned to full duty, 104 returned to limited service which included all types of duty except combat. Sixty one were sent to the zone of the interior because of the severity of their chest wounds. Ninety were sent to the zone of the interior because of other wounds, their chest wounds were healed and would not have hindered their return to full or limited service. Thus of 320 penetrating or perforating chest wounds 255 were able as far as this type of wound was concerned to return to full or limited duty.

There were 4 deaths in the entire group or an incidence of 1.2 per cent. The causes of these deaths are as follows. One patient who had had an early thoracotomy for a hemothorax

and who had an excellent result developed a pulmonary embolus 20 days after operation. One patient who developed an empyema following a hemothorax and who was treated by open drainage died approximately 3 weeks later of a brain abscess. The third patient was admitted *in extremis* 3 days after wounding with a hemothorax and a transverse myelitis at the 4th dorsal. A catheter was placed in the left pleural cavity. He failed to improve and died within 10 hours of admission. The fourth patient was admitted approximately 10 days after a severe chest and abdominal wound. An abscess was present in the left upper lobe and a peritonitis with a paralytic ileus was present. Decompression with a Miller Abbott tube was done. Three days later the abdominal wound disrupted. This wound was repaired but death occurred 4 hours later.

When the number of complications which arose in this series and the severity of wounds are considered a group of 6 patients is not too great a number to return home for further surgery.

We feel that a number of factors have made such results possible. In the last war one large factor in the invaliding of large numbers of soldiers was the presence of a chronic empyema. Decortication of the lung while an old and discarded procedure has in many instances in this series spelled the difference between a relatively normal chest and a chronic empyema. In fact in the group of empyemas cited here several were 3 months old and chronic when we first saw them. Their lungs were decorticated and they are now well.

Early intrathoracic débridement in the thoracoabdominal wound has without doubt saved many lives. It restored the integrity of the respective body cavities which had been destroyed by wounding. Many of the patients mentioned would have surely died had it not been for the early and adequate care which they received.

It becomes clear that hospitals are very necessary near the lines. It is also clear that the personnel of these installations must be well trained surgical specialists in order to be able to cope with the heavy and intricate problems which face them. It is distinctly a

credit to our Army that the man power and materials have been made available in these places. If lives are to be saved it is necessary to have forward installations with men and equipment capable of restoring deranged physiology. It is likewise necessary to have farther back centers containing suitably trained surgeons to care for the pathologic conditions produced by early injuries. Such advantages we have had and to us the results here tabulated reflect it.

Chemotherapy has been used when it was thought to have virtue. In the patients operated upon by us the sulfonamides have been used but rarely. The bacteria encountered were known to be resistant to this type of therapy and therefore no good reason could be seen for their use. Penicillin was available in large amounts only during the last months of the time in which this work was done. It is our present feeling that it has been of distinct aid but because of lack of an adequate comparative series our ideas are still not fully crystallized. Undoubtedly the greatest factors have been the adequate replacement of blood loss and careful surgery. Before extensive restorative procedures are undertaken the blood picture should be as near normal as is possible. This may mean waiting a few days. At times as much as 3 000 to 4 000 cubic centimeters of blood are given. We have found that the delay in these cases is well worth while.

Proper anesthetics administered by well trained physicians and nurses have been of great value. Intratracheal nitrous oxide gas oxygen and ether anesthesia has been routinely used. It is evident to us that much of the work could not have been attempted had not excellent anesthesia methods been available.

These results we believe reveal that lung wounds properly treated can and do give encouraging results. They also indicate that

definite surgery should be done whenever possible in the theater because of the high percentage of patients capable of return to some form of duty.

SUMMARY AND CONCLUSIONS

1 Three hundred and twenty cases of penetrating or perforating wounds have been observed and the results of treatment recorded.

2 The results of early definitive surgery have been compared with delayed definitive surgery.

3 Fifty four empyemas developed or an incidence of 16.8 per cent.

4 Sixty one patients returned to full duty, 104 to limited duty in this theater, 90 were returned to the United States because of wounds other than the chest wound which was healed and would not have hindered return to full or limited duty. 61 were returned to the United States because of their chest wound. 4 died.

5 Six patients will need further surgery to obliterate a chronic empyema, 4 of which had an accompanying bronchial fistula.

6 Hemothorax is best treated by early aspiration if clotting occurs and organization takes place. Decortication of the lung should be done.

7 Early thoracotomy for clotted hemothorax does not obviate the possibility of a later organizing hemothorax and the percentage of empyemas is higher than in the conservatively treated group.

8 Intrapulmonary foreign bodies are removed from the lung with a lower percentage of poor results after the acute process of wounding is past, i.e. 2 to 3 weeks after wounding.

9 Early thoracotomy is indicated in wound of the mediastinum, especially the postmediastinum in wounds of the diaphragm and in tension pneumothorax not controlled by catheter drainage.

EXPERIENCE WITH LUMBAR SYMPATHETIC GANGLIONECTOMY FOR WOUNDS OF MAJOR BLOOD VESSELS OF THE LOWER EXTREMITY

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CIVILIAN experience with sympathectomy in the treatment of vascular disease made us anxious to determine whether or not this operation would be of value in the management of acute peripheral vascular trauma due to war wounds. This report is based on observations made in first priority surgical hospitals (platoons of field hospitals) over a period of 11 months. During this time we have treated approximately 500 freshly wounded urgent battle casualties with wounds of all types. Only 4 of these patients had wounds for which we felt lumbar ganglionectomy to be indicated and in these 4 the operation was performed. We have done sympathectomy on 4 additional patients seen in consultation with other surgeons of this group. These 8 cases form the basis of this report. The series is small but it will be appreciated that the number of patients for whom ganglionectomy may be considered form a very small percentage of the casualties seen in a fairly extensive and representative surgical experience.

We believe that patients presenting peripheral vascular wounds should have ganglionectomy performed for the following reasons:

1 To encourage collateral circulation as far as possible by promoting a regional vasodilatation in the extremity. Ganglionectomy does this by interruption of the sympathetic vasoconstrictor impulses.

2 To relieve spasm in the arterial tract of the extremity in the knowledge that extreme vasospasm may exist either with or without gross injury to a vessel wall.

3 In the hope that should amputation eventually become necessary it might be performed at a lower level and a healthier stump be obtained in the presence of enhanced collateral circulation.

4 In the hope that the increased circulation after ganglionectomy might help to lessen the likelihood of anaerobic infection.

Trauma to the great peripheral vessels may be of four types: (1) that in which the vessel is so severely torn that loss of continuity is inevitable; (2) that in which the vessel is so damaged that repair by suture is possible with reestablishment of continuity; (3) that in which the wound has led to thrombosis of a vessel with or without actually perforating its wall; (4) that in which the integrity of the vessel wall is not impaired but in which severe spasm of one or more vessels occurs as the result of trauma to the extremity. It will be understood that the element of spasm may be present in types 1 to 3 as well as in type 4.

We observed that paravertebral block with procaine was frequently used as an adjunct to the treatment of major peripheral vascular wounds. The rationale of this procedure is fundamentally the same as that for operative ganglionectomy, viz that by abolishing sympathetic vasoconstrictor impulses maximal vasodilatation of the lower extremity is accomplished and the collateral circulation is thereby enhanced. It is also a well established fact that procaine block of the lumbar sympathetics is an appropriate means of eliminating vasospasm. We feel that an effective procaine block repeated at the customary 8 or 12 hour intervals should suffice in management of wounds of type 4 mentioned and also in wounds of type 2 in which a satisfactory repair of the vessel has been secured and blood flow distal to the suture line demon-

strated at the time of operation. We have had no experience with wound of type 3.

It is in wounds of type 1 however in which there is injury to the vessel which necessitates permanent occlusion (ligation) that we feel ganglionectomy may prove most useful. Here we are dealing with the loss of all or a part of the major blood supply to a limb in addition at times to an associated vasospasm. The early establishment of adequate collateral circulation is imperative if the limb is to be saved. We feel that if any effort is to be made to save such an extremity all possible means should be employed and there should be no temporizing or half measures.

Ganglionectomy was elected as the procedure of choice in these cases for the following reasons:

1. The beneficial effect of paravertebral block with procaine is transitory and the injection must be frequently repeated.

2. Technical difficulty in obtaining adequate block with procaine has been encountered with failure to obtain the desired effects in some cases. The same may be said for alcohol injection.

3. We believe that ganglionectomy serves as a prophylactic measure against thrombosis. The debrided missile wound must be left open. The vessels can at best be protected only by lightly suturing the fascia over them; further closure is contrary to one of the cardinal rules of war surgery. Vessels which lie near the site of the wound but which have been spared and upon which the survival of the extremity may depend are susceptible to thrombosis. This danger is probably greater in the presence of an open wound than it would be if primary suture were possible. Should sepsis occur the threat is increased. By reason of its increased volume of flow a sympathectomized vessel is less likely to become the site of thrombus than one not so denervated. Should a surviving major vessel become occluded collateral circulation in the sympathectomized extremity will be more adequate than if operation were not done.

4. If paravertebral block is employed repeated injections may be necessary in patients who are desperately ill with associated thoracic abdominal or head injuries. Move-

ment of these patients to and from the operating tent is likely to precipitate shock and should be avoided if it is possible particularly in the early postoperative period. The presence of a plaster cast for concurrent fracture in some cases makes paravertebral block impossible. Furthermore the procedure of paravertebral block is technically most difficult to perform with the patient on a low cot in a crowded ward tent.

5. Even though the difficulties enumerated in paragraph 4 are not always present the surgical removal of the appropriate lumbar sympathetic ganglia is advocated because it is the only certain means of obtaining the desired effects.

Our experience has convinced us that ganglionectomy is a feasible procedure even in the severely wounded. We have had no mortality and no morbidity attributable to the performance of lumbar sympathectomy. The opinion has at times been expressed that the severely wounded battle casualty is a poor risk for extensive surgery and that in face of prolonged procedures these men do not survive. Our observation has been to the contrary both in wounds of the extremity and in other types. We feel that disaster is more likely to occur from incomplete surgery than from more prolonged but thorough procedures. The severely wounded soldier given adequate and continuous shock treatment and expert anesthesia will survive procedures of considerable magnitude and duration. We are strongly opposed to the school of thought which urges the surgeon to get the patient off the table before he dies. The fear of a death on the table may lead to hurried and inadequate operations. The surgery must be complete otherwise the patient may be lost from complications which might have been prevented.

Eight lumbar sympathectomy ganglionectomies for acute vascular injuries of the lower extremities are reported the total number that we have performed up to the time of this writing. In 6 cases amputation subsequently became necessary. The other 2 patients achieved sound normal limbs. On the basis of these results one can neither praise nor condemn the procedure as used for this type of

injury. We intend to continue its use in the effort to determine definitely its place in the management of acute vascular wounds. A larger series of cases and knowledge of the experience of others may yet prove its usefulness.

CASE REPORTS

CASE 1. Civil n g e d y e a r s W n e d b y h n d g r e n a d a t 3 3 0 p m D e c e m b e r 1943. He b r o u g h t t h e f i l d h o s p i t a l 2 h o u s f t r i n j r y. A b u l k y p e s r e d e s i g h a d b e n a p p l i e d t o t h e g h t g r i n p r t a l l c o n t r l i g h e m o r r h g e E a m i a t o n s h w e d s p e f i c a l o u n d s o f t h e a b d o m i n a l w l l a n d i g h t l w e r l g n d a 3 c e n t m t e p n e t t g w o u n d f t h g h t g o u f o m w h i c h t h e r e w a c t i e b l e d n g. T h p t t a s i n m l e d e t h i s m e s h c k p a l a n d w i t h u n b t i n a b l e p u l n d b l o o d p u r D u g a d m i n a t a t n o f h i l o d n d p l a m a t h o c k t e n t h e m r h a g e f r m t h g o n b e c a m s o p o s t a t t h p t n t a n a n t h e t i z e d b y p e n d r p e t h a n d t h v e s s b w e c l m p d. T h c a l f w n t t e n s e A t n t i m w s y p b a t n f i t i n t h e a t e r o f t h e f o t. A f t n t i l s h o c k t r t m n t t h a n e s t h t i d p t t w a t a k a t o t h p t n g t n t O p t n m m a c d a t 7 3 p m. T h f m o l r t v s f n d t o h c m p l t l y e v e d b u t a c h b l o w t h e g n o f t h e p o f u n d a. T h l a t t e r a t e y w a i n t c t n d p l a s t i n g. T h f m l t r y w a s l g a t d w t h l k. T h f m o l v i n w a s c o m p l t l y v d a t t h l e l i f t h e i g n f t h e p f n d a h c h a d t e n d s e l g a t d w i t h s i l k. T h f o g u h o d y w h c h l a y i n t h e g o a f t e p p o a t w s n o f o u n d. T h t h w u n d s w e d h d d. R i g h t l u m b a p a v e r t b l o c k w a d n e d t b u t i n g c u b c t m e t r s f p e n t p o c e i n t h e g n f t h e d 3 d n d 4 t h l u m b r g g l. T h f t w w a r m p u n k a d d r y a t t h e e n d o f t h e p t. A b u l k y c t t n d e s g v a s a p p l i d t t h e n t l g.

T h f l o w i n g m n n g t h e l g n d f t s t l l a p p e a e d v a b l. A t 3 m g h t l m b a s y m p a t h e t m y w a s d e t h r u g h t h p p a c h a d c a t d b y S m t h w k a n d t h d a n d 3 d g n l a t h t h t e r v g h a s w e e m o d f l l g p t n d u t l c u a t n d a y l t t h g h t f t w a s d y d w a m t h n t h l f t.

This was our first case. The child was practically exsanguinated when first seen. After the beneficial result of the paravertebral block was observed it was felt that sympathectomy should be done to give maximum possible re-establishment of circulation. The possibility of thrombosis of the femoral artery lying in an open wound susceptible to infection was considered a further indication. It should be noted that the calf was not tense

CASE 2. American s l d e a g e d 5 y e u s t e d g u n s h t w n d t i i o o a m D e c e m b e r 1943. H e a n e d a t t h e f i l d h o s p i t a l a b o u t 1 h r a f t e r i n j u r y. O n e m i t n h f o u n d t o l n s e v e r s h c k. H e h a d a p f o r a t n g o u n d f t h g h t b u t t o c k a n d a s m l l p n t i n g w u n d n t h e r g i n o f S c a r p a t r i a n g l n t h e r i g h t. T h e p o p t a l a n d d o r s l i s p d i s p l e c o n t h e r i g h t w e r e u n b t a i n a b l e. T h e c a l f w a s n o t t e n s e. A n a y e x a m i n a t i o n h o e d a f c t u e o f t h e c o c c y x n d a b u l l e t n e a r t h h e a d o f t h e r i g h t f e m u r. O n d g t a l e x a m i n a t n a t a o f t h e e c t u m v a s f o u n d.

A t 11 45 p m o p e t i o n a s c o m m e n c e d. A l o o p s i g m o d o s t o m y w a s d o n a n d t e n s v e d e b i d e m e n t f t h b u t t o c k w o u n d w a s f o r m e d. I t h c l o s u r e o f t h e r c t l t e a r a n d r s e c t i o n o f t h e c o c c y. T h f e m o r a l t r y a n d v i n w e e x p o e d a t t h p r o f n d r e a. A h e m a t o m a i n t h v a l l o f t h e a r t e r y w a s e v a c a t e d b y l o n g i t u d a l i n c i s i o n h i c h w t h e n c l e d. T h e a d e n t i t w a s t r i p p e d f o m t h e a l l f t h e a r t e r y f r a d t a n e o f 6 i n c h e s a s t o p e f m p e a t e r i a l s y m p a t h e c t o m y. P l a t o n s w o b s e r v e d b e l o w t h e t i p p e d a c a h c h v s d i s t l t h p o f n d a h u c h. T h e l e g w a s p t n e t e n s o n a k l l e r B l a k e s p l n t.

O n D e c e m b e r 1 t w a s n o t e d t h t t h e f o t s c o l d n d b l a n c h e d a n d t h e r s a l p e d i s p l s w a s n t p a l p b l. A g a n g l o n c t o m y w a s a d v i s e d a n d p f o r m e d a t 8 p m. T h S m t h w k a p p r o c h u s d a n d f o n d p a r t c h a l y c n y m e n t b c a u s e f t h p r s n c o f t h e l o s t m y. T h e d a n d 3 d g a n g l v t h i n t e r v i n g n e r e e m v d. F o l l o w a g o p a t n t h e w a s n o d c i h l c h a n g e t h e p p e a n c o f t h f o t.

O n D e c e m b e r 23 t h l g v a m t o t h a n k l b u t t h e f o t r m a d c o l d. T h p a t i n t w a s e v a c a t d a f e t d y s l a t w t h t m p o v m t n t h c i r c u l t n o f t h e f o o t. O n J a n u a r y 5 1944 a g e a l h o s p i t a l a g l l t i n l o w e r l e g a m p t a t i o n w a d n e l v a g a t b i a l t m p o f a b o t 7 i n c h.

In the light of subsequent observations we feel that sympathectomy was performed too late in this case to be of maximum benefit. The procedure may have saved the knee. It is possible that this man suffered embolism from the traumatized femoral artery.

CASE 3. A m c a n s o l d g d 2 y e a r s w a s o u n d n a t o n b y h l l f r a g m e n t a t 4 00 p m. D e c e m b e r 23 1943. H e a r v e d i n t h e f i e l d h p t a l h t 3 h u r s f t e r u n d g W h n f i r s t e n h w s n a m k d d g r e f s h c k. B l o d p e s u e a n d p l w i m p c p t b l. T h e w a s s m a l l p n t r a t g w o u l i n t h e u p p e r p r t o n f t h e i g h t t h i g h a t l v. A t r n q t w a s i n p l a c e a n d w a a d q a t e t n t r l i e m h g e w h h a d p p a e n t i v b e a m t s. S h c k t h a p y v t h b l o o d a d p l a s m a w s m m d a t e l y i n s t i t u t e d. M e d e t i l d m i n t n o f t h e r i g h t l e g r r e v e a l e d t h t h c a l f w a s f i m t n s n d t e n d e v e n t h o g h t h e w s n o w o n d h l o w t h g o u n a n d h u s a n y r y w s o n l y

symp th ctomy and this w pe f med at oo
p m by tulzing the lo er q ad nt grdur n in
c sio No benent as n ted f om th s pr cedur
At 5 00 p m May 7 gas g gen was f nd to h
p ese t i the leg a d a m d thigh mputat n w s
done unde ether

Following amp tat ec very was g d

The remarks made in comment on Case 7
apply equally here

CASE 9 Briti h officer ag d 6 v ars w nd
d by a spent mach n g n h l l t t 9 00 m on
N embe 9 943 ecei i penet at g ound of
the left thigh At the t me he was wound d h had
h n lv ng n a muddy slit t ach f r 48 h rs d
h d bee ith t food d i th t t m Sh rtly
after receiving the bullet wound he ht in
th s t m by a hand g nade wh ch burst cl to his
trench d ca sed a p trah ng wound of the ri ht
ye He lav where he as hit f r about 4 hours
He reach d the casualty cle mg tat n som 34
hours fte bei g first ounded At that t m h was
mldlv acidotic in slight shock (bl d p ess
100/7) and not ble ding A m ll pen trat g
ound as present in the md porti n f th l ft
th gh poste i ly The m s ul was p lp hl s b
cut n ou ly te o ly Puses w r p es nt n foot

Ope at n v a pef med 8 00 p m n N m
b r io Th foreg h dy in th l g as m d
th ough a a tenor c nteri c The w d i n
e try as enl g d and d ebr d Th fem l n
as to n but the artery was t t The n was
l gated ith silk The t ry as v s bly d p l
p ably in marked spasm If w ver f hle p batons
s t come th ough and th spasm t l
t th end f the ope ation Du th pe t n
th e as d f ficulty ntrol ng hl d f om th
e n and a o d ng i jury t the t tact a terv a d
sc i e n e r e The pat t lost ns d hl
q t t y of bl o d a d eq d th adm t t n f
bl d and plasma d ng th op at n Wh n th
p e dute as compl ed a p ve th l p can
i j ct on of o c b e c e t meters in th g n f d
a d 3 d l m b r g n g a s d iths m wa m ng
f the calf res l g b t n p bes we p lp bl n
th e f t l h g n r l nd t n pp d f r l g d
p b wa 3 b t f g d q l iv d bl d p es
n m l t th me f t nt th w d

At m d n ght of th d y of p rat h rad l
p b e a g d Th f t h e as cold
cy t c a d p b les Th pat t was t y t
c ed from the anesth t c Ea ly th f ll w ng
m rn g h b cam d nt d p b became rap d
l bl d p es re fl Th e was n d f
gas nf ctio In pt l v g ppo t
meas es he f l d t c d d d t o a m
N embe i

A topsy as nf tu t ly t po hl H m y
ba d d of blast iny y d t th rv l
plo e n f the h d g n d H h d t r m l
a ra nd death m y h b d t transfus n

ction It is c t in that he was in a m e p
ca ious phys iolog cal state at the t me of ope rat
than was fully app eciated a d tho gh h was co
pe ted when the ope rat n was sta ted t took th
los of only a elatively small amo nt of blood t
p ecp tat sh ck dur n the proced e

The effect of paravertebral block in th
patient was definite though not complet
satisfactory in that restoration of circulat
to the foot was not effected It is possible th
had he not suffered from severe peripher
vascular collapse repeated lumbar bloc
m ght have permanently relieved the arteria
spasm Repetition of the block or sympathet
tomy was contemplated the choice betwe
the procedures to depend on the condition o
the foot 8 hours after operation However
the patient's collapse demanded that al
efforts be directed at saving his life This w
were unfortunately not able to do

EVALUATION

In reviewing these histories it becomes ap
parent that in Cases 7 and 8 too much time
was lost between injury and sympathectomy
for the latter to be of benefit As the sum
maries of these 3 cases show the lower leg n
each appeared nonviable at the time of gan
glionectomy If sympathectomy is to be done
it should be done as early as possible that i
at the time of the original operation for th
injuries From our experience with these 3
cases it would seem hardly worth while to
employ sympathectomy in patients in whom
the limb is already clinically nonviable

A condition commonly seen in lower ex
tremities with acutely impaired circulation is
the so called tight calf This condition was
observed in 2 cases (3 and 6) In neither were
the wounds so situated as to cause hematoma
of the calf It is thought that tight calf is due
to a cloudy swelling of the muscles due to
anoxia The condition can arise early (Case
3) We feel that in such cases one may po
sulate that sympathectomy without extensiv
lower leg fasciotomy is useless Unfortunately
we failed to employ fasciotomy in these 2
patients Whether or not the legs would have
survived had we used a combination of sym
pathectomy and fasciotomy we do not know
but we strongly urge a combination of the

two procedures and intend to employ the combination in such cases in the future. Tense calf muscles are seen sufficiently often so that one should always examine the lower leg in these patients to determine the presence or absence of tension.

In wound of the lower leg hematoma frequently comprises circulation distal to the point of trauma. Extensive fasciotomy with out sympathectomy has been employed by us in such cases and found sufficient to save the leg even when two of the three major vascular bundles were severed. When the condition of the patient with such an injury has permitted the use of spinal anesthesia we have felt that the temporary interruption of vasoconstrictor impulses has been beneficial. This property of spinal anesthesia should be kept in mind and its employment in carefully selected cases may prove advantageous.

We believe that certain indications for the performance of ganglionectomy may be proposed. The possible benefit to be derived from the procedure should be considered in the management of any traumatized extremity presenting evidence of vascular impairment. Points to be searched for in examination of the patient are the absence of pulses in the foot and popliteal space, a leg colder than the normal one, blanching, cyanosis or mottling of the foot or leg, early loss of cutaneous tactile sensibility and the presence of a tight calf. The presence of any of the foregoing conditions should serve as a warning that serious vascular damage exists and usually several of them will be found in the same extremity. The presence of a tight calf we believe to be of particular significance in indicating as it does a serious degree of anoxia.

Given any of the physical findings mentioned it is imperative that at operation upon the wounds the surgeon visualize and completely understand the exact nature and extent of the vascular injury. In the majority of patients presenting the signs we have mentioned either direct injury or severe spasm (or both) of a major vessel is almost certainly present. If damage to a major vessel is found in a patient presenting these signs we believe that sympathectomy should be done. If spasm alone is found paravertebral block

should first be tried and may well prove adequate. Should the patient's other wounds make it apparent that repeated blocks will be arduous for him sympathectomy should be done at the first sitting.

We believe that the patient's chances will be favored if ganglionectomy is done in all wounds to the iliac, femoral or popliteal arteries and in patients with wounds of the thigh who present a tight calf. Sympathectomy should be considered as a prophylactic measure in dealing with wounds to major vessels (e.g. the superficial femoral artery) if the circulation is not grossly impaired.

There are certain contraindications to ganglionectomy. It will obviously serve no useful purpose in limbs so severely traumatized that primary amputation is necessary. If the patient is seen late following wounding the likelihood is that sympathectomy will do no good. In general if a limb appears nonviable and changes are at all advanced with a beginning line of skin demarcation sympathectomy will probably be useless. Our earlier hope that the operation even in these cases might save a part of the limb and make possible a lower amputation has perhaps been borne out in 1 instance (Case 2). In patients in whom the time element is borderline it might be well to perform paravertebral block and base the final decision for or against ganglionectomy on the observed effect (Case 9).

It will be appreciated that great attention to detail is necessary in the handling of the type of injury under discussion. The dressing is particularly important. We have found that a satisfactory method of protecting an extremity with precarious circulation is to wrap the member in an extra thick layer of cotton from toes to groin and to incorporate it in a light circular plaster cast with a firm posterior splint. Then the entire cast and padding must be bivalved. Examination of the leg can be made simply by removing the top shell. The object of such a dressing is to give an even distribution of pressure and thereby prevent pressure points and necrosis.

A word should be said with regard to the use of dorsal sympathectomy for injury to the vessels of the arm. We have seen no case, either of our own or of our associates in which

this procedure appeared indicated. As one would expect the collateral circulation in the arm is practically always adequate to assure viability (e.g. Case 4). Patients we have seen with vascular trauma sufficient to jeopardize the limb have all required amputation because of the extent of the damage to other parts. A rare case may be seen in which this condition is not so, and for this dorsal ganglionectomy should be kept in mind.

Two points must be finally emphasized. First, ganglionectomy to be of benefit must be performed early; it is probable that after 24 hours tissue damage is irreversible. Second, ganglionectomy is an adjunct only in the management of these wounds. Thorough debridement with meticulous care for the structure involved, complete visualization of the pathology and attention to detail in dressing are imperative. Supplementary procedures must be performed as indicated; fasciotomy for tight calf may be cited.

TECHNIQUE

The rationale of the operation of ganglionectomy lies in the fact that when the central vasoconstrictor impulses to a vessel are interrupted, maximal relaxation of the arterial smooth muscle results. It has been further demonstrated that the most permanent and complete results are obtained by a procedure which interrupts preganglionic fibers only. This is accomplished satisfactorily in the case of the lower extremity by removal of the second and third lumbar sympathetic ganglia (1).

We have employed an extraperitoneal approach to the lumbar ganglionated chain in all cases. Three were done through the flank approach advocated by Smithwick; the others through the large lower quadrant gridiron incision of Leriche. We have found that the approach of Smithwick is most convenient in small patients and in those in whom the presence of other wounds made the gridiron incision impractical (Case 3). It has been found, however, that if one does not have available certain instruments, particularly Deaver retractors longer than those in standard use by the Army, Crile nerve hooks, Hart

man forceps, Cameron light and a long dura clip carrier, that the operation is technically difficult due to the depth of the wound. It is also impossible to place the patient in optimum position for this approach on the operating tables available in the field. Therefore we advocate the lower quadrant gridiron incision for the usual case done in forward hospital.

The transperitoneal approach which we have not used might prove the most feasible in patients requiring laparotomy and sympathectomy. We have had one such patient in whom the missile after penetrating the groin perforated the right external iliac artery and passed upward causing extensive visceral damage. Transperitoneal sympathectomy through the laparotomy incision would have been performed on this patient had he survived his massive hemorrhage and intra-peritoneal damage.

SUMMARY

It is our opinion that lumbar ganglionectomy if it can be performed early, should be considered in the management of wound from the bifurcation of the aorta to the bifurcation of the popliteal artery which jeopardize the circulation to the lower extremity. The real test may lie in its use in cases of severed popliteal artery for very few extremities survive with injury to this vessel. Presence of an intact profunda femoris artery in the face of loss of the superficial femoral has been found to be no guarantee of the viability of the extremity. Collateral circulation of the lower leg has been found to be sufficient even in the presence of ligation of two of the three major vessels. It is felt that ganglionectomy will be less frequently indicated in injuries to vessels of the lower leg than in those of the thigh.

It is our hope that this paper will stimulate the interest of others in the use of ganglionectomy as an adjunct to treatment of wound of the major peripheral blood vessels and that their results will be reported. Thereby the true value and place of the procedure in treatment of this class of wounds may be established.

REFERENCE

SMITHWICK, R. H. N. E. gl. d. J. M. 94 699-5

ASEPTIC GASTRIC RESECTION

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NEARLY forty years elapsed between Souligoux's proposed technique of gastroenterostomy and the present method of gastric resection with closed aseptic anastomosis. The latter has been advocated by Wangensteen, Babcock, Totten, Holman, Weinstein, Emerson, Neuber, and Monteiro.

It is interesting to review the technique which avoids opening the stomach and intestinal cavities at the time of anastomosis. Briefly stated, it is as follows:

1. With a special forceps the portions of the stomach and intestine where the anastomotic opening is to be made are crushed. This crushing traumatizes particularly the mucosa and muscularis and has the least effect on the serosa.

2. Caustic potash is applied to that portion of the gastric and intestinal serosa demarcated by the blades of the forceps.

3. A seromuscular suture is made around the crushed and causticized area. After 48 hours when this tissue sphacelates the anastomotic opening is sealed off without contamination by coalescence of the serosas held in apposition by the sutures.

Gudin, Wadhams, Luquet, and others have contributed much to the development of aseptic gastrointestinal anastomosis. Wadhams and Luquet advocated electrocoagulation of the walls of the stomach and intestine followed by seromuscular sutures around the electrocoagulated area such that when the eschar separated there was already coalescence of the serosas and the opening was established without contamination. This is essentially the principle advocated by Souligoux.

Closed intestinal anastomosis has been popular since Doyen in 1897 in an effort to effect hemostasis. He established the principle of crushing the intestine in order to close it aseptically. With his angiotribe the intestine was reduced to paper thinness. With his

procedure contamination from intestinal contents was avoided and its use was advocated in end to end anastomosis ligating the crushed ends, bringing them to apposition with seromuscular sutures, cutting the ligature with scissors introduced through the opening just before completing the encircling sutures.

The method of Doyen was followed by various means of closed anastomosis differing only in minor details. Some surgeons have given preference to anastomotic clamps, others to traction sutures.

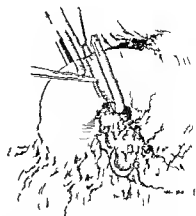
It is not in the scope of this paper to discuss all the various methods of closed intestinal anastomosis. The closed method of intestinal anastomosis was worked out at our clinic while the open anastomosis for the stomach was still in use. Hemorrhage was feared if the mucosa was not sutured. The few immediate and late bad results were accepted because of the 80 per cent good results.

In 1918 Gudín, in discussing asepsis and hemostasis of gastrointestinal surgery, reported his first failure in aseptic gastrectomy. In 1939 and again in 1941 Gudín presented in Rio de Janeiro and in Buenos Aires motion pictures illustrating his technique of gastrectomy with closed anastomosis. Before the National Academy of Medicine in 1943 he presented a paper in which he brought forward the value of what he termed lamination. He presented his own instrument which he believed insured hemostasis and at the same time he emphasized the importance of using traction sutures as recommended by Pauchet instead of anastomotic clamps. He believed that his method was a further improvement in gastrointestinal surgery.

Since 1935 the von Ietz (5) suture instrument has been used in our clinic to close the duodenum in gastroenterostomies and also to close the large bowel after surgery. In typical subtotal gastrectomies the technique of Reichel-Polya as developed by Montenegro has been continued. When the von Petz suture



F 3 T t pl d th ru h d p t f th
d od W se g th h th nb th
Bar t gull t



F 4 Th t mp f th d od m b d th
purst g t l th t sc h w th gull t
has t th ty t d losed sept vity

instrument is used the technique of Hoffmeister Finsterer¹ followed the clip from the segment of the stomach to be anastomosed are removed and the operation is finished by the open method

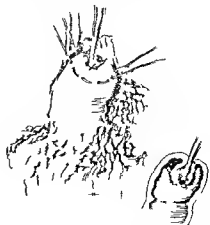
In the beginning of 1943 the technique to be described was devised. It was decided to apply the closed method of anastomosis in gastric resections for the following reasons: (1) the reliability of the closure of the von Petz suture instrument (2) the assurance of hemostasis by electrocoagulation (3) the good results of closed aseptic anastomosis in bowel

surgery (4) the good results obtained in our experiments in dogs and (5) the opinion of other experienced surgeons voiced in recent publications—Wan ensteen Babcock Totten and Holman

In 1943, 2 gastric resections were performed by the new technique in Buenos Aires. After witnessing the operations Prof. Galindez remarked that the technique was revolutionary. It is our opinion that it is evolutionary rather than revolutionary because it merely advances one more step the technique of closed anastomosis of the gastrointestinal tract. It



F 3 T t pl d th ru h d p t f th
d od W se g th h th nb th
Bar t gull t



F 4 Th t mp f th d od m b d th
purst g t l th t sc h w th gull t
has t th ty t d losed sept vity

is my belief that the present technique of anastomosis insures asepsis simply because the sutures do not pass through all coats. Sutures that do pass through all coats act as drains from the cavity of the gastrointestinal tract into the subserosal space.

The absence of edema about the anastomosis eases the postoperative course to such an extent that there is no need for the employment of the Abbot Rawson tube. It is impressive when the postoperative course following this technique is compared with that following open anastomosis.

While the perfect method of aseptic gastrectomy has not been developed we do appear to have arrived at a safe technique that brings excellent results. On the basis of the results in 40 cases in which patients were carefully followed it is believed that this new technique can be recommended. It is possible that further improvement in technique will include the use of a special insulated clamp that will permit the employment of an electric cautery after the completion of the seromuscular suture.

Another problem we hope to solve is how to deal with treacherous duodenal ulcers while

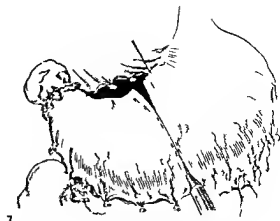


Fig 5 The pylorus is closed with a rubber cap. The stomach is sutured to the cap. The suture is applied to the stomach wall. The suture is applied to the stomach wall. The suture is applied to the stomach wall.

adhering to principle of closed aseptic surgery. Up to the present time submucous separation has been done according to the method of Montenegro which seems preferable to the technique of Nissen. This very interesting subject will be discussed in another article which is soon to be published and in which will be considered the question of whether or



Fig 6 The stomach is closed with a special lamp. The stomach is closed with a special lamp. The stomach is closed with a special lamp. The stomach is closed with a special lamp.

Fig 7 The stomach is closed with a suture. The stomach is closed with a suture. The stomach is closed with a suture. The stomach is closed with a suture.

Fig 8 The stomach is closed with a suture. The stomach is closed with a suture. The stomach is closed with a suture. The stomach is closed with a suture.



F 9 l ft Th p th d f th t m ch ha b lo d th l ps h
 b m d f m th l tw th d Th j j m b h d th ru h
 l mp l G d b g d
 F g Th M t lamp ppld t th g f rush d ea f th
 j j m d th es f ru h d tss b ung m d w th th l t c knif
 Th l w fi h l t gul t f th cut m a f j j um th m
 p oc d a f th t m ch ft th l p m d

not terebrant ulcers of the duodenum should be removed and also how to proceed with this step without interfering with the aseptic technique

TECHNIQUE IN GASTROENTEROSTOMY

1 The blood vessels of the greater curvature are ligated either above or below the great arterial circle in case an ulcer is present and always below in case a malignant growth is present

2 The pyloric and gastric arteries are transected and doubly ligated

3 The duodenal stump is closed in the following manner

a The stump is crushed with De Martel's clamp and tied with a temporary suture that is cut with Barreto's guillotine after the stump has been inverted by means of a pursestring suture

b A von Petz (5) clamp is applied followed by inversion of the stump with a pursestring suture or with the Halsted's quilt suture

TECHNIQUE IN GASTROJEJUNAL ANASTOMOSIS

After the von Petz suture instrument is applied to the stomach at the level to be removed the clips are compressed and a special clamp of my own design is applied just above the proximal row of clips. By means of an electric scalpel the stomach is severed between the two rows of clips thus removing the distal segment. Two types of clamps of my own design are used the larger one for the Reichel Polya anastomosis the smaller for the Hoffmeister Finsterer type the latter being preferable. The clips remain on the portion of the stomach which is not to be used in the anastomosis and are buried with Halsted's quilt suture

A jejunal loop about 20 inches in length is selected for antecolic anastomosis. The portion to be anastomosed is crushed with the Tammorator clamp of Gudin then removed and one of my own clamps is applied. The jejunum is approximated to the stomach and under the clamp the posterior seromuscular suture is made. This suture begins at the

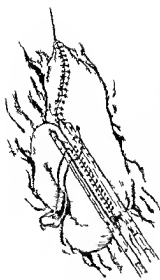


Fig 1

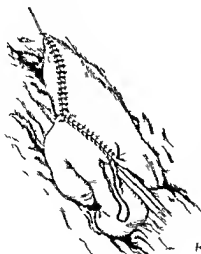


Fig 2



Fig 3

Fig 1 Se m scular s tur bel th l m ch nd
jun m falls below th lamps
Fig 2 Th muscula tur carried th
clamp to th l n wld w t th bas filh lamp

Th lamp rem ed then and th l mpt d
Fig 3 Aft th muscula tur mpt d ll
und few enf ed t rupted l es ppl d n
the t n d post n wll d th gies

base of the clamp and extends up to the tip of the clamp. The excess of crushed jejunum is removed and also the distal row of von Petz's (5) clamp from the stomach.

The cut edges of the stomach and jejunum are lightly electrocoagulated. This done the seromuscular suture is continued around the tips of the clamps and above them until their base is reached. At this point the clamp is removed and the suture is completed by closing the fenestration which has been caused by its removal.

The efferent loop of the jejunum is then buttressed over the suture line of that portion of the stomach not used in the anastomosis. A few reinforcing interrupted sutures are applied at the angles and around the circumference of the anastomosis to complete the operation. The anastomosis is made patulous immediately by the employment of the thumb and forefinger from the outside.

COMMENTS

The method of aseptic gastric resection here described has been found most satisfactory. With it it is possible to avoid filiform

drainage along the sutures from the mucosa. Thus drainage with contamination is inevitable if the sutures run through all layers of the stomach or bowel.

The von Petz (5) and similar clamps have been found most useful in carrying out the procedure but they can be dispensed with when the electric scalpel and the so called laminator the crushing clamp are used. Slow and gradual crushing alone even if prolonged for one hour does not guarantee hemostasis.

That certain trephating ulcers are not satisfactorily handled by crushing should not prevent the use of closed anastomosis where indicated any more than should the occurrence of perforated ulcers. Nor is one justified in my opinion in advocating open resection for gastric ulcers and closed anastomosis for carcinoma.

SUMMARY

An improvement in the technique of aseptic gastrectomy is described. The technique has been used in 40 cases of ulcer with 1 death. This death was not the result of faulty technique.

The technique described might have been adopted earlier had I not felt satisfied with 80 per cent good results and fear of hemorrhage. Only after becoming confident of hemostasis by crushing and electrocoagulation or ligation of the submucosal vessels through experiments on dogs was the decision made to abandon the mucosal suture and to adopt this new technique.

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SUCKING WOUNDS OF THE CHEST

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SUCKING wounds of the chest are met commonly among the seriously wounded casualties admitted to an evacuation hospital. While they are encountered seldom in civil practice and infrequently in military hospitals not in the field, we believe that our experiences in dealing with them may be of interest to surgeons engaged in war surgery in forward hospital units and to others doing secondary thoracic operations for the late complications. This communication will deal with the preoperative operative and postoperative management of patients with open wounds of the thorax up until the time that those who recover are well enough to be evacuated to the rear. This echelon of surgical treatment is today a field in itself. Only the immediate results can be presented since the end results in this group of cases cannot be known for some time.

During a 3 month period 70 patients with sucking wounds of the chest were treated in an evacuation hospital during a very busy period. These patients represented 8.1 per cent of a total of 89 casualties with injuries of the thorax. Of this group 31.5 or 36.7 per cent were known to have hemothorax, pneumothorax or both. This figure undoubtedly would have been larger if condition had permitted more complete study. The progressively increasing dangers associated with open pneumothorax however made the sucking wound group the greatest problem. Shock, mediastinal flutter with interference with cardiac action, anoxia from ineffectual respiration, loss of body fluid and heat and infection of the pleural cavity are some of the particular hazards encountered.

DIAGNOSIS

The diagnosis of an open chest wound had usually been made at a forward installation

and an occlusive vaseline gauze dressing with tight adhesive strapping applied. In some cases however the diagnosis had been missed and a sucking wound would be found under the original blood soaked battle dressing. In only 1 of our cases had emergency suture been performed and incidentally this proved to be ineffective. A properly applied vaseline gauze dressing was nearly always adequate. On admission of patients with chest wounds an inspection of the dressing was made at once on the shock ward or in the preoperative wards and the patient was asked to cough unless the diagnosis of open pleural communication was obvious. A gush of air or blood on coughing occurred in positive cases not previously detected. A good occlusive dressing was then applied.

Of equal importance and perhaps of more importance than the diagnosis of the open pneumothorax is the question of the diagnosis of factors complicating the picture in these patients, namely the presence or absence of shock, severe respiratory or circulatory embarrassment, hemorrhage from the lung or chest wall injury to the mediastinal or abdominal organs and injury to the contralateral lung. Moreover the surgeon is interested in the number and location of fractured ribs and foreign bodies and the extent of any associated injuries which in themselves influence the various decisions he must make.

CLINICAL FINDINGS

In our group of 70 cases 48 wounds were the result of shell fragments, 18 were incurred by machine gun or rifle bullets and in 4 the type of missile was not stated. In 49 instances the wounds were of the penetrating type, in 20 they were perforating, i.e. through and through and there was 1 gutter type of wound. Fractures of the ribs or costal cartilages were known to be present in 44 cases, 20 of which had multiple fractures but the true figure was probably higher. In addition

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fracture of the clavicle was seen in 3 cases and fracture of the scapula in 1. Right sided wounds were nearly twice as common as left sided 45 of the former as compared with 23 of the latter. Presumably left sided wounds were more frequently fatal on the battlefield. In 2 patients there were bilateral sucking wounds and in 4 there were 2 sucking wounds on the same side. Shock was present on admission in moderate or severe degree in 37 cases. This figure would probably have been higher had not many cases received from 1 to 4 units of plasma and in a few cases blood transfusions as well at forward installations. Severe shock was of course more common in the sucking thoracoabdominal wounds and in large thoracic wounds with considerable bleeding. Slight to moderate dyspnea was present in two thirds of these patients most of whom required oxygen and there was severe dyspnea and cyanosis in 9. Wound hemorrhage was severe in 9 cases and was important not only because of the blood loss involved but also because it was liable to loosen the occlusive dressing and re-establish the open pneumothorax. All cases had some degree of hemothorax and pneumothorax but the former was severe (estimated at 1000 cubic centimeters or over) in 10 cases. Only 1 instance of tension pneumothorax was found in 1 patient with a valvular sucking wound at the medial end of the left clavicle. Mediastinal emphysema caused by a small laceration of the trachea was also present in this case. Another instance of moderate mediastinal emphysema occurred in a patient with perforation of the trachea which required closure and tracheotomy. On admission to the hospital pulmonary edema was well marked in 3 patients 2 of whom died though the condition probably occurred more frequently to a lesser degree when one considers the lung damage and paradoxical respiration commonly present in open chest wound. Right sided heart failure may be precipitated in such cases by the large amounts of blood and plasma used in combating shock especially if they are given rapidly. The treatment of shock complicated by pulmonary edema is very difficult for this reason. The significance of blast injury in these cases is difficult to assess but is probably

not often an important consideration. The diagnosis was made in 1 of our cases from the history and by roentgenograms. Atelectasis was diagnosed from the admission roentgenograms in 8 instances. There was homolateral partial or complete collapse of a lower lobe in 7 cases and a contralateral atelectasis of the cardiophrenic segment in the other case. In addition densities attributed to intrapulmonary bleeding and to aspiration of blood into the bronchial tree of uninvolved portions of the lung were met with frequently. Moderate to severe gastric distention on admission was evident in 5 cases. This complication is to be watched for especially in wound of the lower left thorax. Morphine poisoning was encountered twice and in 1 case characterized by respiratory depression, pin point pupils, cyanosis and terminal convulsions it contributed largely to the fatal outcome. One half grain of morphine tartrate had been given hypodermically before admission in practically every case and the familiar phenomenon of increasing morphine effect as the patient's shock improved was sometimes troublesome. The use of not over 4 grain of morphine sulfate is recommended as the first dose in the average chest wound and no more than 1/6 grain dose subsequently. Bilateral and multiple sucking wounds have of course a grave prognosis. Two patients not only had 2 sucking wounds on 1 side but also 1 sucking wound on the other hemithorax both died. Two other men with 2 sucking wounds on the same side recovered. Associated injuries obviously have great significance especially abdominal injuries (21 cases), severe compound fractures (16 cases) and spinal cord injuries (2 cases). Apart from abdominal injuries there were severe associated injuries in 22 patients and slight or moderately severe wounds were present in many others.

EMERGENCY AND PREOPERATIVE CARE

All patients known to have sucking wounds were treated in the shock ward and oxygen therapy started if necessary for dyspnea and cyanosis. Patients were left on the same litter until they arrived in surgery and sometimes until they reached the postoperative

ward. The blood pressure and pulse rate were determined immediately and at frequent intervals as a guide to treatment and prognosis. Patients in shock without much dyspnea were left flat until they improved, then they were propped up in bed. Those with dyspnea were more comfortable reclining on a back rest from the outset.

A transfusion of stored citrated blood was begun as soon as possible in those showing signs of shock and hemorrhage. Even if the blood pressure was within normal limits these patients were known to have lost blood, and it was nearly the rule to give at least 2 units of plasma and 500 cubic centimeters of blood to each patient. Early in the campaign the blood was altered into an equal quantity of normal saline or plasma for greater ease of administration. Later more transfusions of whole blood were given, especially in cases in which it was anticipated that 1000 cubic centimeters or more of blood would be necessary to lessen the likelihood of pulmonary edema from the administration of too large amounts of intravenous fluids. In 27 cases in our series one 500 cubic centimeters transfusion was given before or during surgery; in 16, 1000 cubic centimeters was given; in 4, 1500 to 2000 cubic centimeters; and in 3, 500 cubic centimeters or more of blood was administered. Delay of blood replacement therapy until the postoperative period in cases of pulmonary bleeding has been recommended by some, but we believed that it was best to give these patients relatively large amounts of blood and plasma before and during surgery.

The injured side was kept down if there was much hemoptysis or paradoxical motion of the chest due to extensive rib fractures. Chest pain on cough or motion or pain elsewhere due to associated injuries was common if more than 6 hours had elapsed since the last dose of morphine. Restlessness was frequent because of pain and anoxia, so that some patients thrashed about in bed and attempted to remove the oxygen mask or catheter. Usually $\frac{1}{2}$ grain of morphine sulfate hypodermically or $\frac{1}{4}$ grain intravenously was given. Most patients disturbed from pain, dyspnea, anxiety, and the ambulance ride improved considerably after the first hour of

rest, oxygen, blood replacement therapy, reclining posture and sedation. Intercostal nerve blocks with 1 per cent procaine for pleuritic pain have been recommended but none was carried out in our series.

Physical examination of the chest and survey of the patient for other wounds were carried out as soon as practicable. It goes without saying that patients in severe shock should be turned as little as possible, but examination of the anterior chest may yield signs of hemothorax, pneumothorax, mediastinal deviation, paradoxical respiration, and subcutaneous emphysema.

Tetanus toxoid was given to American wounded on admission if it had not already been administered, and tetanus antitoxin was given to other wounded. The administration of penicillin in doses of 20,000 units given intramuscularly every 4 hours was started in all cases, and sulfadiazine, 1 gram every 4 hours orally, was prescribed except when there was vomiting or suspected abdominal involvement.

Severe or progressive dyspnea and mediastinal shift necessitated aspiration of air and blood in 9 of our patients during the preoperative period. Intubation of the chest for water seal drainage was necessary in the case of tension pneumothorax mentioned. However, there seems to be no reason to aspirate moderate sized collections of air or blood preoperatively in patients who are reasonably conditioned for surgery.

Aspiration of the stomach with a Levine tube was carried out preoperatively for dilatation in several cases and probably should have been done more often to decrease the incidence of vomiting in the period of recovery from anesthesia.

Diagnosis of abdominal involvement may be easy because of the position of the wounds of entrance or exit, presence of gastric content or bile in the chest wound drainage, hematuria or hematemesis. The position of a retained projectile in the roentgenogram with a visualization of its course is most important in difficult cases. Muscular rigidity and tenderness are rather unreliable signs of abdominal involvement since they are common on the wounded side in injuries of the lower thorax.

For this reason anteroposterior and lateral films of the abdomen were always made when any suspicion of abdominal involvement was entertained.

When a patient was out of shock and was not uncomfortable out of oxygen he was sent to have roentgenograms made. Anteroposterior and lateral chest films were made with the patient sitting up if possible. Occasionally it was necessary to take them with the subject reclining or supine and sometimes even through the litter when the patient's condition was poor. In 4 cases of severe perforating wounds it was thought best to forego x-ray examination because of the condition of the patients and the obvious extent of their injuries.

While sucking chest wounds had surgical priority it was thought that once they had been sealed and shock overcome it was time well spent to let the circulatory and respiratory mechanisms adjust themselves to the new situation. For example we believed that a delay after the administration of rather large amounts of blood and plasma was advisable before surgery was undertaken since another 2 or 3 hours probably have little effect in increasing the incidence of empyema and may well make the patient a better operative risk. In other instances the surgeon's hand may be forced by continued bleeding from the lung, chest wall or liver by the presence of evisceration of the stomach or intestine or by large sucking defects poorly controlled by dressings.

The length of time between injury and surgery in our series of cases varied greatly for many reasons but averaged 23.5 hours. The interval between admission and surgery ranged from 1 to 36 hours and averaged 10 hours. Some delay was often unavoidable of course because of the scheduling of other urgent cases.

ANESTHESIA

In most cases the patient was transferred from the litter to the operating table and a slow infusion of blood or plasma started. The patient was given 1/100 grain of atropine sulfate intravenously and 1/6 grain of morphine sulfate as well if he had had none in the past several hours. No morphine was given

to patients in poor condition however. Anesthesia was induced with a mixture of nitrous oxide, oxygen and ether with the patient supine or propped up slightly. After insertion of the endotracheal tube he was turned to the appropriate position for surgery. The anesthesiologist could now control respiration, the dressing could be safely removed and the skin prepared for operation. In patients with large hemothorax or those only recently out of shock turning, sometimes caused a sharp fall in the blood pressure and it was at this stage that the anesthesiologist had to watch his patient more closely.

Of the 64 men operated upon 43 received endotracheal ether and another 6 were given an ether-oxygen mixture with the anesthesia machine. The former was preferred because of the facility of controlling respiration in securing an airway and aspirating blood and secretions during and after surgery. A large endotracheal tube was used without a Guedel cuff or pharyngeal packing about the tube. The positive pressure which could be exerted to reinflate the lung during closure was therefore limited. However air was aspirated from the chest catheter for this purpose in some cases.

The anesthesiologist preferred to maintain a constant flow of 5 to 7 liters of oxygen a minute since this procedure seemed to give better oxygenation than the use of half a liter a minute with the closed system. Once the tube had been passed little ether was required and the patient was maintained in the upper plane of surgical anesthesia. During wound closure and transdiaphragmatic procedures he was kept deeper to insure quieter respiration.

Postoperatively the tracheobronchial tree was aspirated with a catheter in most instances and in several patients in whom there was considerable secretion and atelectasis bronchoscopic aspiration was carried out. In 1 case bronchoscopy was performed before insertion of the tube for the same reason. Patients in poor condition at the end of operation were kept on the table for an hour or more if this was feasible while the administration of oxygen and blood was continued.

While the use of sodium pentothal as an anesthetic agent is ordinarily contraindicated

in patients with anoxia or excessive tracheo bronchial secretion it was used in combination with nitrous oxide and oxygen from the machine in 10 cases. Most of these were patients with small sucking wounds in whom there was little respiratory difficulty. The method was satisfactory in this selected group and its advantage lay in the time saved. It is not recommended for thoracotomy however.

Three patients were operated upon under local procaine anesthesia. One of these had a severe thoracoabdominal wound with evisceration of the stomach and large intestine and he was operated upon while in shock in an attempt to close the pleural and abdominal defects. In the other 2 cases there were small pleural openings which the surgeon succeeded in closing after intercostal nerve block and local infiltration.

OPERATIVE TREATMENT

Of the 70 patients with sucking wounds 64 were operated upon and 6 died without surgery. The operative treatment of this group of patients is divided into the repair of structures in the chest and abdomen and closure of the chest wall and the operations for additional unrelated injuries. Usually all surgery can be done at once but in severely injured patients it is sometimes wise to deal with the chest and abdominal injuries first and to postpone operations on the extremities spine or head for 48 hours or longer.

Three principal types of thoracic operation were performed: (1) wound debridement and closure of the chest opening; (2) thoracotomy and (3) thoracotomy plus transdiaphragmatic exploration of the upper abdomen.

Simple debridement of the wound with or without resection of a fractured rib and closure of the thorax was performed in 25 cases. This procedure was usually followed by aspiration of the hemopneumothorax with a syringe and large needle or the intubation of the chest for closed catheter drainage. The latter is indicated if a large hemopneumothorax or established infection of the pleural cavity is present and also if there is suspicion that tension pneumothorax may develop. In

of our cases the chest was not intubated until 4 hours after operation when the

wounds began to suck again because of inadequate closure. In 1 instance the lung re-expanded and the wound healed well after simple closed catheter drainage for 48 hours. In the other the patient had to return to the operating room for a thoracotomy.

In this group the pleural opening was frequently small and intercostal rib resection was performed in only 4 cases. Ten in all had serious associated wounds and in 4 patients laparotomy was also performed for abdominal injury.

This procedure of wound debridement and closure of the chest opening without exploration of the thoracic cavity is most applicable to the following types of wounds: first to small sucking defects especially intercostal ones where the indications for thoracotomy are not present and second to thoracoabdominal wounds in which the major problem is in the abdomen with little or no lung damage and which usually occur if the missile has traversed only the costophrenic sinus before entering or leaving the abdomen. Here a laparotomy may be done plus debridement and closure of the chest wound with intubation or aspiration for the hemopneumothorax.

There was 1 death among these 25 patients an indication in most instances of the nonserious nature of the chest wounds involved rather than a recommendation of this type of operation. The patient who died had a large evisceration of the stomach and colon through the abdominal wall with a small sucking chest wound. There was considerable hemorrhage with shock. He has been referred to above as one of the 3 patients operated upon under local anesthesia.

The indications for thoracotomy are enlargement of the existing pleural opening usually with resection of segments of one or more ribs to permit inspection and operative procedures within the pleural cavity are considered to be as follows: (1) any large sucking wound with fractures of one or more ribs; (2) suspected diaphragmatic hernia or perforation of the upper abdomen; (3) suspected continued bleeding from the intercostal vessels the lung internal mammary vessels mediastinum or liver; (4) presence of large intrathoracic foreign bodies or driven rib

fragments (5) suspected wounds of the trachea bronchi esophagus or heart and (6) clotted hemothorax

After debridement of the wound or wounds the thoracotomy incision is usually made at the site of the sucking wound parallel with the fractured rib. A posterior incision like that for a first stage thoracoplasty may be necessary for posterior wounds of the apex. A thoracotomy incision separate from the wounds of entrance or exit is in our experience seldom necessary or advisable.

Twenty three of the 64 cases belong in this second group. Rib resection was carried out in 21 of them and in 9 segments of more than 1 rib were removed. In the other 2 cases exploration was done through an intercostal incision. After hemostasis of the chest wall and insertion of a self retaining retractor blood and clots were evacuated from the pleural cavity and in section was carried out with the aid of a lighted retractor. Lacerations of the lung were sutured in 6 cases. Suture was not thought necessary for small lacerations without any bleeding. Debridement of the pulmonary tissue except for removal of rib fragments and other foreign material was not performed in our series. Metallic foreign bodies were removed from the lung or pleural cavity in only 3 instances although a number of others were removed from the abdomen and chest wall. Unless a small missile (1 centimeter or less in diameter) could be easily found no time was lost in searching for it. Larger fragments were sought for and removed if possible and the incision in the lung sutured. Many of the wounds were perforating in type and the problem of foreign body removal was not present.

Closed catheter drainage was instituted in 10 of these 3 cases always separate from the thoracotomy incision. A No. 18 catheter was inserted and sutured to the skin usually in the 8th or 9th interspace posterolaterally or sometimes in the 6th interspace laterally. Closed drainage is a safeguard against respiratory embarrassment due to accumulation of fluid and air postoperatively. Breakdown of the closure and unrecognized acute empyema and nonreexpansion of the lung. In cases with gross contamination of the pleural cav-

ity 60 000 to 100 000 units of penicillin were injected and the tube clamped for several hours. In some cases especially where postoperative tension pneumothorax is probable it may be wiser to insert anterior and posterior catheters.

Closure of the thoracotomy incision in layers was now carried out beginning with the parietal pleura and periosteum to either with the intercostal muscles. It is advisable to have at least a two and better a three layer muscular closure. Pedicled muscle grafts from the chest wall muscles were often sutured into the pleural defects which had not been completely closed with the first continuous double suture of No. chromic catgut. Additional muscle layers were then closed with interrupted sutures overlapping the first closure. Pericostal sutures were used a number of times. These were most useful in drawing together intercostal incisions but were not necessary in our experience when rib resections had been performed. The subcutaneous tissue and skin were closed with loose interrupted sutures after a mixture of sulfanilamide and penicillin powder 4 parts to 1 had been dusted into the wound. The external wound of entrance and exit were left open only if the skin defects were too large to close or if the interval since wounding had been so long that infection seemed likely. Tight adhesive strapping was then applied over a vaseline gauze dressing.

There were 4 deaths in this group. Two of them were due to shock and hemorrhage immediately after operation. One man with bilateral hemothorax died of pulmonary edema 23 hours and another 3 hours after operation. In the latter case circulatory failure was probably precipitated by the administration of too large amounts of blood and plasma.

In the third group of 16 cases thoracotomy and transdiaphragmatic repair of upper abdominal structures were performed. Rib resection was carried out in 10 patients 2 of whom had segments of ribs removed and in 6 of whom the incision was intercostal. Suture of lung lacerations was done in 1 case and removal of shell fragments from the lung in 1 instance.

POSTOPERATIVE MANAGEMENT

The frequency of involvement of the various abdominal organs is interesting. The liver alone was involved in 8 cases, liver and kidney in 2, stomach and liver in 1, spleen and stomach in 1, spleen and kidney in 1, and the diaphragm alone with diaphragmatic hernia in 1. The other case illustrates how extensive these wounds can sometimes be. This patient had a sucking wound of the left lower chest through which gastric content was escaping. A thoracotomy was done first after resection of the 7th rib and transdiaphragmatic repair of a lacerated liver and 2 perforations of the stomach were carried out. After closure of the chest laparotomy was performed, 12 inches of jejunum resected and end to end anastomosis performed. In addition another jejunal perforation was closed and the transverse colon was exteriorized for multiple perforations. He had bile in the pleural fluid for several days but otherwise his immediate postoperative course was fairly smooth.

Five patients had a laparotomy as well as thoracotomy, but it is of interest that 11 cases could be handled adequately from the thoracic approach alone. Actually splenectomy and repair of the upper portion of the stomach are more easily performed through the chest than through the abdomen.

Six of these 16 patients with sucking thoracoabdominal wounds in whom transdiaphragmatic operation was done died after operation, 4 of them within 5 hours after surgery as a result of traumatic and operative shock. Another died 40 hours after trans thoracic splenectomy and repair of a perforated stomach apparently of irreversible shock. The other death was due to anuria 8 days after nephrectomy, suture of a severe liver laceration and closure of the open chest wound.

The subject of thoracoabdominal wounds is too large to consider in detail in this communication. To sum up, however, in the 10 patients with sucking thoracoabdominal wounds operated upon, 11 were subjected to thoracotomy and transdiaphragmatic procedures, only 5 had a thoracotomy plus laparotomy, and 4 had a laparotomy with simple closure of the chest wound and aspiration or intubation.

Oxygen therapy was continued on the ward in most of these cases with supportive treatment with blood and plasma as indicated. Gastric suction was started on recovery from anesthesia in cases of diaphragmatic hernia, perforation of the stomach or intestine, or in any other case with gastric distention or vomiting. Penicillin was continued in doses of 20,000 units intramuscularly every 4 hours usually for 5 to 7 days along with sulfadiazine 6 grams per day. The latter was usually omitted in nephrectomy cases and in abdominal injuries or other cases requiring gastric suction. Frequent turning, deep breathing, and cough were encouraged and morphine injections limited to 1/6 grain doses.

The chest catheter was ordinarily removed in 48 hours after injection of 40,000 units of penicillin in 20 to 30 cubic centimeters of normal saline. Its patency was checked every 6 or 8 hours by aspirating the airway needle of the water seal bottle or if necessary by irrigating the catheter with a little saline solution. If there had been gross contamination of the pleural cavity with gastric content or evidence of bile in the pleural fluid, catheter drainage was maintained for about 4 days. If an empyema appears, closed drainage must be continued.

Reaccumulation of serosanguineous fluid was usual but unless physical signs or chest films indicated a moderate effusion (i.e. greater than 200 to 500 cubic centimeters) it was not aspirated. If subsequent aspirations were necessary, penicillin in saline was introduced as before and the fluid was not replaced with air. In our series 18 patients were aspirated once postoperatively, usually on the 4th or 5th postoperative day, 6 were aspirated twice, and 2 were aspirated 4 times in an attempt to re-expand the lung.

Anteroposterior and lateral chest films in the sitting position were commonly taken on the 4th or 5th day after operation except in the case of thoracoabdominal wounds where the physical signs were the guides, since it was thought best not to move these patients during the first week.

In sucking thoracic wounds as in other wounds involving hemothorax and lung col-

lapse early re-expansion of the lung is a prime consideration and this was encouraged by breathing exercise and by having the patient sit up over the side of the bed several times a day on the 4th postoperative day and thereafter. The latter procedure had to be omitted in the case of patients with thoracoabdominal wounds although they could be propped up on a back rest and deep breathing encouraged.

POSTOPERATIVE COMPLICATIONS

Postoperative shock was the principal complication and cause of death. It was evident in severe degree in 9 cases. Many of these patients had been in shock on admission and had improved enough to be operated upon but the additional factors of operative trauma and anesthesia proved to be too much for them. A few were operated upon while in shock who did not respond to treatment.

Atelectasi was first evident postoperatively in 5 cases bronchopneumonia in 3 cases severe pulmonary edema in patients (both of whom died) and massive fatal pulmonary hemorrhage in 1 case. There were 2 instances of bronchopleural fistula in 1 case the fistula closed after 4 days of water seal drainage and the lung had re-expanded a few days later in the other a large pneumothorax remained in spite of repeated aspirations of air and the lung was still collapsed when the patient was evacuated a week later.

Two cases of wound disruption due to inadequate closure and failure to intubate the pleural cavity have already been mentioned. Some wound infection appeared in 3 cases but undoubtedly it occurred in other cases after they had left our hands since in most instances the debrided wound had been sutured at operation. The diagnosis of frank empyema was not made in any of these patients before evacuation but it was thought that at least several patients later developed it.

Drainage of bile from the operative wound complicated liver injuries in 3 cases and in 2 of these bile was present in the pleural cavity. In 1 case mild peritonitis was thought to be due to the presence of bile in the peritoneal cavity and in another to contamination of the peritoneal cavity by gastric content from a perforated stomach.

Abdominal distention was troublesome in 5 cases. The use of gastric suction in many of the thoracoabdominal cases probably kept this complication at a minimum.

There were three transfusion reactions of the hemolytic type in this series. This high incidence can probably be attributed to the use of stored Type O blood without previous cross matching and to the rather large number of multiple transfusions given. Uremia occurred in patients with kidney injury. One of them had had a nephrectomy and repair of a severe laceration of the liver and diaphragm.

In addition there was a temporary toxic psychosis in patients probably precipitated by pain and anoxia. A cutaneous reaction to sulfadiazine was seen in 1 case and thrombophlebitis of an arm vein after prolonged intravenous therapy in 1 case.

EVACUATION

The average period of hospitalization before evacuation in our series was 6 days but varied from 3 to 15 days depending on the individual case and the military situation. Patients with laparotomy were kept for a minimum of 10 days. Occasionally military exigencies required us to evacuate our patients sooner than we ordinarily would have done and once we were obliged to transfer patients to the care of another hospital unit before they were ready for evacuation.

In general we kept patients with serious chest wounds for at least 6 days or more and those with thoracoabdominal wound for at least 10 days. It was thought that patients well enough to be evacuated at all could best be evacuated by air since the dangers of anoxia and expansion of a pneumothorax were not anticipated in air transport at low altitudes. Many of our patients were so evacuated.

RESULTS

Only the immediate results of treatment can be given since the final mortality and morbidity of these patients can be properly judged only after several months of observation. For the surgeon in the field however the question of immediate results is an important one. There are several factors which

affect operative mortality in these cases among them the length of time between wounding and admission which very often depended upon the military situation and the admission of a large number of other priority cases. The desire of the surgeon to do all he can for a badly wounded man in spite of poor response to shock therapy will increase the operative mortality. At the same time however such a tendency may favorably influence the overall total mortality. It is with the total mortality that we should be concerned since operative mortality varies with the estimation of operability. Experience has encouraged us to increase the operability rate. In this series 91 per cent of our patients were subjected to surgery.

Seventeen of this series of 70 patients with sucking wounds died and represent a mortality rate of 24 per cent. Six of them died without operation in from 4 to 24 hours after admission as the result of shock which did not respond to treatment. In 2 cases pulmonary edema was prominent and in 1 case morphine poisoning appeared to be most important. The 11 postoperative deaths in the 64 patients operated upon represent an operative mortality rate of 17 per cent.

Both the general mortality rate of 13.9 per cent and operative mortality rate of 7.6 per cent were less among 243 patients with penetrating and perforating nonsucking wounds of

the pleural cavity admitted during the same period. Likewise patients with thoracoabdominal wounds without open pneumothorax had a mortality rate half that of the sucking type.

SUMMARY AND CONCLUSIONS

1. Patients with sucking wounds of the chest make up an important part of the seriously injured casualties admitted to an evacuation hospital in a combat zone. The authors' experiences with 70 such cases including 21 with thoracoabdominal wounds have been presented.

2. Adequate preoperative preparation including the closure of the open pneumothorax with occlusive dressings, the treatment of shock and anemia and the recognition of associated abdominal injuries is highly important.

3. Sixty-four patients were operated upon, an operability rate of 91 per cent. The indications for the various surgical procedures used have been reviewed.

4. Postoperative treatment is directed toward the correction of circulatory and respiratory disturbances, re-expansion of the lung and prevention of infection.

5. The overall mortality rate, 24 per cent and the operative mortality rate, 17 per cent were higher than those for other patients with penetrating and perforating wounds of the pleural cavity.

ELECTRODIAGNOSIS BY MEANS OF PROGRESSIVE CURRENTS OF LONG DURATION

Studies on Peripheral Nerve Injuries in Man

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THE relation existing between the rate of variation in current and the minimal strength of current required to produce excitation has been investigated by physiologists for many years since an attempt was made to study it by DuBois Reymond in 1862. Bernstein, von Fleischl, von Kries, Fick, Schott, and Gildemeister were among the older investigators.

Such so called progressive currents as have been studied may be divided into linearly increasing or progressive currents and exponentially increasing or progressive currents.

Among the more recent investigators to whom more accurate methods of measurement have been available and who have studied exponentially rising currents may be mentioned Liberson, Schriever, Delville, Cardot, and Laugier, and Hollander, Solandt, and Fahre. In these experiments the duration of rise of the exponentially increasing current to its peak was less than one second, often fifty to two hundred milliseconds. In the more recent experiments on linearly increasing or progressive currents the longest period likewise was usually less than 1 second. In the case of Lucas 1 second. In 1907 Lucas published the results of his studies on the sciatic nerves of the toad and frog and on the sartorius muscle of the frog. He found that the minimal rate of rise which he called the minimal current gradient in the case of the toad was of such an order that the minimal strength at instantaneous stimulation would have to be increased 46 times at the end of a second to produce an effective stimulus for the sciatic nerve of a frog, the minimal strength at instantaneous

stimulation would have to be increased 6, times at the end of a second to be an effective stimulus. Among his conclusions is the following statement:

It is found that as current gradient is decreased the current strength required for excitation increases more and more rapidly until a definite minimal gradient is reached. No gradient less steep than this will excite.

The belief that progressive currents possess less than a minimal rate of rise will not stimulate even though they finally reach a considerable value was likewise expressed by Hill. From Lucas' experiments Blair reached the conclusion that when the gradient is too low for the rheobase to be effective no voltage is effective.

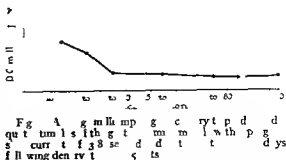
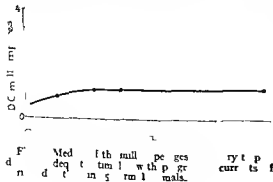
In an analysis of Solandt's data obtained from stimulation of the frog's sciatic nerve with exponentially rising currents it may be seen that with a minimal gradient the current increases at a rate such that a value 16, times the rheobase value is reached in 0.27 second.

In a former publication some of us (23) showed that when progressive currents of long duration 1.2, 2.6, 3.8 and 8.8 seconds are used as stimuli for normal cat muscle we were unable to confirm the existence of the minimal gradient. In the case of the normal muscle the minimal current at instantaneous stimulation or the rheobase was 0.4 milliampere. At 1.2 seconds the current was 0.8 milliamperes or twice the rheobase. At 2.6 seconds 1.0 milliamperes or 2.6 times the rheobase. At 3.8 seconds 1.1 milliamperes or 75 times the rheobase (Fig. 1). At no time was the rheobase current adequate to stimulate, yet with a current of long duration 8.8 seconds an increase of only 87 times the rheobase was an effective stimulus.

From the Department of Internal Medicine and Medical Diseases, Northwestern University Medical School, Chicago, Ill. General Hospital, Chicago, Ill. This work was described in the paper presented at the 1925 meeting of the American Medical Association, held at the Hotel Sherman, Chicago, Ill. It was recommended by the Committee on Medical Research, between the Office of Scientific Research and Development and the National Academy of Sciences.

In earlier years the impetus for development of new wave forms of stimulation was the desire to imitate the normal contraction of a muscle and to avoid the abrupt movement produced by sudden closure of a current whether faradic or galvanic (Bergonie). In 1907 Bordet described an apparatus for the production of a galvanic wave current lasting as long as 2.5 seconds. With regard to diagnosis he noticed that when a muscle is degenerated the time necessary to reach a current adequate for stimulation is long as compared with that necessary for normal muscle with which the liminal current must be reached more quickly. For similar reasons Laquerriere designed a new apparatus on the basis of the work of Bergonie. In 1912 Becker described an apparatus called a myomotor which delivered saw tooth waves. In 1931 Delherm and Laquerriere described an apparatus which delivered alternating currents of long duration and unidirectional galvanic wave forms. The currents described by Bordet, Laquerriere and Delherm, Duhem designated as currents of long period to distinguish them from currents described by d'Arsonval in 1891 and by Lapicque who without knowledge of the work of d'Arsonval published his results in 1915.

Whereas the currents designated as those of long period may last several seconds, those designated as progressive currents by Delherm last only a fraction of a second. From the standpoint of their contribution to diagnosis it is said of both types that a degenerated muscle will respond to the condition in which a liminal current is reached more slowly, whereas with the normal muscle this amperage must be reached more quickly.



Although many articles in the literature are concerned with progressive currents of long period (more than 2 seconds) the clinical material from which data have been obtained is small. No accurate measurements of time and current are described and no experimental work is recorded.

It is necessary we believe better to define a progressive current. We take such a current to be one which increases with time. The kind of progressive current is determined by its wave form for example whether linear, exponential or sinusoidal. The progressive current used in our former experiments was a linearly increasing one consisting of the ascending limb of a unidirectional galvanic wave of isosceles triangle type. The decision to use a current wave of this type in preference to a saw tooth wave was based on several considerations. In the first place one is able to observe a contraction at the peak of the wave. Also one is able to obtain simultaneous readings of the voltage and strength of current at the instant of the contraction. In addition one is spared the confusion resulting from unwanted break contractions which are likely to occur with the saw tooth wave.

As the result of former experiments we showed that in the cat within a few days after denervation the amount of current necessary to excite the muscle by progressive currents of long duration was usually somewhat higher than the amount required by the normal muscle. It began to diminish after about 10 days and between 30 and 40 days it was less than normal and remained so as long as the animal was studied.

It was seen that as long as 203 days after denervation the rheobasic current being 0.18

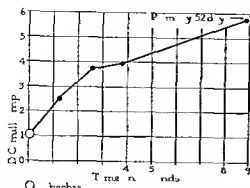


Fig. 3. Milliamp g necessary t prod d q t
 tum f th g t mi m d f cat 5 d ys
 aft prim y t d 4 days ft p no cha t
 at f d tv ted m l h b f d

milliampere contraction occurred at 8.8 seconds with 5.73 milliampere (Fig. 2)

In contrast to the period of denervation at times before and sometimes coincident with evidence of motor return the amount of current necessary to produce excitation must be increased considerably above the rheobase when the current is allowed progressively to increase for long period. Thus in Figure 3 4 days prior to the recorded examination made 52 days after primary suture the muscle reacted as a denervated one. On the 52d day the rheobase was 1.15 milliamperes at 1.2 seconds contraction occurred with 2.5 milliamperes at 2.6 seconds with 3.75 milliamperes at 3.8 seconds with 4 milliamperes and at 8.8 seconds with 5.73 milliamperes. As regeneration progresses the amount of current necessary for excitation becomes even greater and a normal pattern is not reached even when fairly good motor recovery has taken place (Fig. 3).

Soon after we had begun to examine muscles supplied by injured peripheral nerves in man it was found that the use of absolute values of the threshold amperage for progressive currents of long duration to indicate denervation and regeneration might lead to misinterpretation in some cases. The reason for this is found in the fact that when the rheobase is high the threshold amperage for progressive currents must be higher therefore when as the consequence of edema or other changes in the tissues the rheobase or threshold current for instantaneous stimulus

is high the threshold amperage for progressive currents must be higher therefore when as the consequence of edema or other changes in the tissues the rheobase or threshold current for instantaneous stimulus is high the threshold current for progressive current of long duration must be still higher. As a result in some cases when a muscle is denervated the absolute value of the threshold amperage for progressive currents of long duration may be high in others low.

From data described in preceding paragraphs it may be seen that the ratio between the rheobase and the threshold amperage of a progressive current lasting 8.8 seconds was 2.87 in the normal muscle of a cat 15 for a denervated one and 7.7 for the recovered muscle 52 days after suture. When therefore one finds a muscle with a high rheobase it is necessary to determine the ratio between the rheobase and the threshold current for stimuli by progressive currents of long duration. This ratio may be called the ratio for progressive currents to distinguish it from the tetanus ratio for instantaneous current stimulus.

The ratio for both cathodal and anodal stimuli should be obtained since as will be seen the approach toward unity of the polar ratios for progressive currents is characteristic of the state of denervation of a muscle.

The evolution of the changes in this ratio as well as the threshold current as related to the time following section and suture of the cat's nerve in the cat is constant and characteristic. These changes may be divided into four periods. The first during the very early period of degeneration occupying about 14 days the second during the remaining period of degeneration until the period of complete denervation had occurred from the 31st to the 49th day the third the period of denervation and the fourth the period of regeneration beginning from the 49th to the 66th day.

During the first 4 days a number of changes occur the significance of which we do not at this time know. They consist of two phenomena first a very rapid fatigability to progressive currents and a failure to contract when the current is increasing but a contraction when after a current has reached its peak it

approaches zero. Exclusive of this very early change the responses during the period of degeneration and regeneration have a remarkable similarity. During degeneration there is a rapid increase in threshold current both for anodal and cathodal stimuli by progressive currents of long duration reaching a peak at variable times usually from the 17th to the 23rd day. At the same time there is an increase of the ratio of progressive current both for anodal and cathodal stimuli but usually in contrast to the period of degeneration the increase in the ratio is much greater than the increase in threshold current. Then both the threshold current and ratio continue to diminish until the period of complete denervation occurs. At this time the threshold current is at a minimum both for anodal and cathodal stimuli and the ratio often is at unity or a little more both in the case of anodal and cathodal stimuli. When regeneration occurs there is a relatively sudden increase in threshold amperage for both anodal and cathodal stimuli and also a marked increase in the ratio both in the case of anodal and cathodal stimuli (Fig. 4). During the very early stage of regeneration the same peculiar reactions as were seen during very early degeneration are at times noted particularly failure to contract when the current is increasing and response when after having reached its peak the current has returned to almost zero.

The state of denervation is readily demonstrable by the approach to unity of the ratio and minimal threshold current as well as the approach to unity of the polar ratio. If one does not take into account the time which has elapsed since the date of injury so that an opinion may be derived as to whether the state of denervation should be present were the nerve severed or completely injured then from the data of a single examination there might be some difficulty in differentiating the increase of threshold amperage and ratio found during degeneration from that found during regeneration. Usually although the ratio is high in both the threshold amperage is much lower during degeneration than regeneration. Thus it may be said that when the threshold amperage is only moderately high and the ratio quite high we are dealing

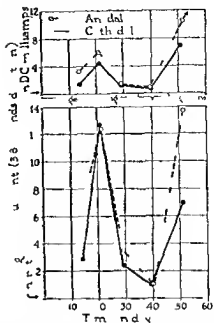


Fig. 4. Millimpe g ry t p d d q t
timal s of th g trocn m m l th p g e t
curr t f 3 sec ds d t d th p gress t
u t n d ys ft prim ry t re f th t
rv f cat

with the changes of degeneration. When both threshold amperage and ratio are high we are dealing with regeneration.

Although we have found this to be true in our experimental work on the cat we have found an occasional exception in man when the threshold amperage as well as the ratio was high and even higher during degeneration than regeneration. However if sufficient time has elapsed for complete denervation to have taken place then a high threshold amperage and high ratio indicates recovery. If at one examination a liminal threshold amperage and a ratio approaching unity and an approach to unity of the polar ratio are found and at a subsequent examination a high threshold amperage and high ratio are found recovery is indicated.

CLINICAL APPLICATION

Although unequivocal evidence for the state of denervation and recovery in experimental lesions of the sciatic nerve in the cat has been adduced by data obtained from stimuli by progressive currents of long duration the

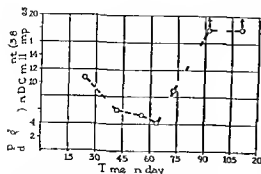


Fig 5 Thresh ld rr t th bum th h t
muscl t n us d ys fl win j ry d se f
th pe l rv h p ress t f 3 3
p d l t d k d to c d t f th se red
p l d d 6 d ys ft j y

validity of this method of diagnosis must be tested by its application to injuries of the peripheral nerves in man.

We have examined over 30 cases with lesions of various peripheral nerves about half of these were civilians and the others wounded soldiers examined at the Percy Jones General Hospital at Battle Creek, Michigan.

The evolution of the changes in threshold amperage and ratio for progressive current stimuli in time after injury to a peripheral nerve injury in man is the exact counterpart of that in the cat.

Exclusive of the very early changes observed in the cat in man after the 14th day following severe injury there is a rapid increase in threshold amperage for anodal and cathodal stimuli by progressive current of both 1 and 4 second duration. This is succeeded by a progressive diminution in threshold amperage until the period of denervation is reached when it is at its minimum and the polar ratio approaches unity. Then when recovery occurs there is again a rise in threshold amperage usually of a much higher order than was the case during the period of degeneration. This may be illustrated by the chart plotting the measurements obtained in a case of peroneal nerve severed by a knife blade at varying days following injury and cure (Fig 6).

In addition there is a parallel change in the ratio derived by dividing the rheobase of anodal and of cathodal stimuli respectively into their threshold current. At first there is a

rise in the ratio for stimuli of both 1 and 3 or 4 second duration then a diminution until at the period of denervation the ratio approaches or is at unity and the polar ratio also approaches unity. Then when recovery occurs the ratio increases usually to a degree as high or often higher than during the period of degeneration. This may be illustrated by a graph plotting the ratio for stimuli of 1 and 3 or 4 second duration in a case of Bell's palsy beginning 27 days after its onset (Fig 6).

During the period of denervation a unity is approached or even is for the threshold amperage and the ratio for stimuli of 1 or 4 seconds duration. On the other hand during degeneration and regeneration the threshold amperages and ratio for stimuli of 1 and 4 seconds duration respectively differ those for the stimulus lasting 4 seconds being higher. This may be seen in Figure 7.

When it is possible to examine a patient who has sustained an injury to a peripheral nerve at frequent intervals throughout the whole period of time from that of injury to that of recovery the validity of a method could quickly be determined. Unfortunately we have been able to do this only in a few cases among the civilian population.

More frequently we had the opportunity to examine patients but once or twice at some period of time following injury or operation. This was particularly true of the cases of wounded soldiers. Certain other standards however can be established for the validity of this method in such cases. In the majority of cases we did not have the opportunity of examining the patient until a time had elapsed

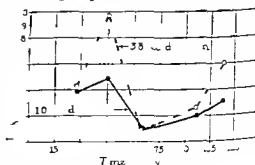


Fig 6 Th p gress curre t i f d f 3 3
sec d d t t ry g d ys fl g th set f
mpl t B h palsy

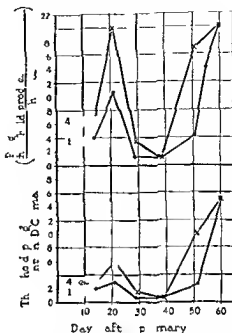
which either resulted in a state of denervation or a state of recovery from a severe lesion

When the characteristics of a state of denervation in a muscle had been found the validity of such a diagnosis could be assessed by the following means First that at operation preceding the examination by a number of days insufficient for regeneration to occur the nerve end were found to be severed Second that subsequent operation revealed a severed nerve Third when a state of denervation was found in a patient in whom operation was not performed spontaneous recovery later occurred at a time compatible with regeneration and was made evident by the characteristic changes in threshold amperage and ratio or later recovery of motion or sensation or both Fourth when in some of the muscles supplied by an injured nerve characteristics of recovery are found by examination with progressive currents of long duration and in another or others characteristics of denervation these muscles later at a time compatible with regeneration show characteristics of recovery of muscles as found by examination with progressive currents or recovery of motion or sensation or both Fifth the characteristics of regeneration follow those of denervation at a time when regeneration could have occurred

When the characteristics of a state of regeneration or recovery had been found the validity of such a diagnosis could be assessed by the following means First that at operation preceding the examination the nerve was found not to be severed or completely compressed Second that at subsequent operation the nerve was found not to be severed or completely compressed Third that motor or sensory recovery ensued Fourth that motor or sensory recovery was present at the time of examination Fifth when some of the muscles supplied by a nerve showed the characteristics of recovery later recovery of motion and sensation occurred

RESULTS OF PERIPHERAL NERVE INJURIES IN MAN

In 36 patients at one time or another in the course of recovery after a peripheral nerve lesion examination by progressive currents of long duration showed the characteristics of a



F 7 Thr h id p gress cur t and t s f
d 4 ds d ti in th gastroc emus m scle t
ryng th ys f li t r g p m ry s t f th sci ti

recovering nerve muscle complex The confirmation of the validity of this electrical sign consisted in one case of an exploration a short time before examination which revealed no severance of the nerve in another exploration soon after examination showed no discontinuity of the nerve In 4 there was subsequent clinical evidence of recovery of motion or sensation or both In 8 clinical signs of recovery of motor or sensory function were present at the time of electrical examination In 2 the validity of the characteristics of recovery consisted of their appearance after the electrical signs of denervation had been present and a period of time compatible with recovery ensued This progression from the electrical signs of denervation to those of regeneration were also found in 7 other patients in whom the validity of the electrical signs of regeneration were confirmed by the fact that at an exploratory operation performed a few days before the examination the nerves were found severed in 6 cases In 1 case a hypoglossal facial anastomosis had been performed before the examination In 6 later recovery

of motor or sensory function followed the appearance of electrical signs of recovery at a time compatible with recovery. Three of these had also been confirmed by the findings at operation. In these occurred recovery of motion or sensation or electrical signs of regeneration at a later date which was compatible with recovery.

There were 4 cases in which the rheobase was so high in 140 milliamperes that examination by progressive current was impossible both because of insufficient output of current and if available such currents would be unbearable. That such a high rheobase is a sign of recovery was found from the fact that later clinical evidence of recovery of motion or sensation or both was found in all cases and in 1 electrical examination conducted 82 days later revealed the characteristics of recovery and motor recovery had begun.

In 4 cases electrical signs of recovery were found but at clinical examination 80, 130, 97 and 90 days respectively after injury no motor or sensory recovery was demonstrated. However it is quite probable that such recovery will take place. In 1 case electrical signs of recovery were shown to be present only 36 days after suture of a peroneal nerve although this is quite early nevertheless we felt that it is quite possible that the nerve is recovering.

In only 2 cases was the method brought into question. In both the deep branch of the radial nerve was injured. In 1 the electrical examination was performed 140 days after injury and again 14 days after operation which revealed that the nerve was severed. In the other the electrical examination was conducted 12 days after operation which revealed a severance of the deep branch of the radial nerve. The operation was performed 93 days after injury. Only one muscle had been examined in each of these cases. Here we feel it is quite possible that some new fibers had found their way to the distal segment.

Of 5 patients examined when electrical signs of recovery occurred the later course confirmed their validity in all but 7 cases in 5 the time which elapsed from the date of suture or injury may well be too short for motor or sensory recovery. In 2 only was

there an equivocal result. In all of the instances when the electrical signs of denervation were found there was a confirmation of the validity of this electrical sign.

DISCUSSION

The indication for the development of methods of electrodiagnosis other than by examination by stimuli of galvanic and faradic current as described by Erb is found in the failure of such methods as ordinarily performed to give accurate evidence of the states of denervation and regeneration. Some of this inaccuracy is the result of imperfect knowledge of the difference in the responses during denervation and regeneration. Some is the result of incorrect views which have been passed down in text books and literature and part due to limitations of such methods.

The state of complete denervation of a muscle can with assurance be determined by such methods both by the very small threshold amperage or rheobase and the approach toward or to unity of anodal and cathodal chronaximetry, stimuli or unity of polar ratio. The other states of denervation and regeneration are then recognizable by the absence of the characteristics described. However it would be difficult to differentiate the degenerating from the regenerating state. Although the existence of response to faradic current 14 or more days after a lesion indicates a potentially recoverable lesion this method is of little value in war wounds. Such lesions recover in a short period of time and by the time a wounded man would have reached a hospital suitable for nerve surgery recovery of motion or sensation or both would have occurred. On the other hand in a spontaneously recovering but severely injured nerve other clinical signs of recovery usually antedate the response to faradic current.

Although our former work on stimulation by progressive currents of long duration indicated clearly that the relatively rapid increase of threshold amperage was an accurate indication of recovery further work upon human material showed that this was not in itself a safe indication. The reason for this was found in the fact that in some cases because of edema and other subcutaneous changes a high

threshold amperage may be present only because the rheobase or threshold amperage for instantaneous stimuli of infinite duration was also high. It was therefore concluded that determination of the ratio for progressive currents of long duration was a necessary part of the examination. This is the ratio between the threshold amperage of a progressive current of any given duration and the rheobase both for anodal and cathodal stimuli.

We have shown that the characteristics of response to progressive currents during degeneration consist of (1) some unexplained peculiar responses very early during degeneration usually within the first 14 days consisting of contraction when the current has reached zero from a peak, (2) a subsequent early rise in threshold amperage and in ratio both for anodal and cathodal stimuli, (3) a fall in both as the state of denervation is approached during all this time there is a disunity between anodal and cathodal stimuli. During denervation the characteristics of changes occurring consist of a minimal threshold amperage, an approach toward or to unity of anodal and cathodal stimuli and a unity of the ratio for progressive currents both in the case for anodal and cathodal stimuli. When regeneration occurs during a very short time the characteristic changes are fleeting responses only when the current has reached zero from a peak, then a sudden increase in threshold amperage or progressive currents usually much higher than in the degenerating state, a very high ratio and a disunity between anodal and cathodal stimuli.

In interpreting the results of examination by progressive currents of long duration it is found that the characteristics of the state of denervation are unique for that state. Both during some time of degeneration and during regeneration a high threshold amperage for progressive currents and ratio is present. However, a high ratio and only a moderately high threshold amperage are found during the state of degeneration and a very high ratio and also threshold amperage during regeneration.

The time which has elapsed from the date of injury or surgery must also be taken into consideration. When a sufficient time after injury has elapsed to permit the development

of the state of denervation and the characteristics of denervation not found, the nerve is spontaneously recovering and should not be operated upon. If after a suture of severed ends of nerves characteristic of the denervated state are not found, one may be certain recovery is taking place. When a sufficient time has elapsed after injury to a nerve to have permitted regeneration and the characteristics of denervation are found, the nerve must be operated upon.

Although the characteristics of the regenerating state indicate that some nerve fibers have regenerated and reached the muscle being examined, this does not predicate complete recovery of other muscles supplied by the nerve involved. More accurately to predict the completeness of recovery, all of the principle muscles supplied by such a nerve must be examined. At times proximal muscles may show the characteristics of regeneration, for example the flexor sublimis digitorum and flexor profundus digitorum and the flexor carpi radialis in a median nerve lesion and the abductor brevis pollicis and opponens pollicis show the characteristics of denervation. In such a case the later appearance of the characteristics of regeneration in the latter muscles would lead to a good prognosis.

For the most part a high rheobase at a time when if a nerve would have degenerated completely, were it severely injured or severed, indicates recovery. When such a rheobase is so high that examination by progressive current is impractical either because sufficient amperage would not be available or because of the painfulness of the very high order of current necessary, further examination is needed. This should consist of determining whether the anodal and cathodal closing stimuli are at or near unity and whether the ratio between the tetanus produced by instantaneous stimulus by strong currents of infinite duration or square waves and the rheobase also approaches or is at unity. When these characteristics are found despite the high order of the rheobase, the muscle is in a state of denervation. The necessity for this additional examination, however, rarely occurs and when it does, ordinarily characteristics of regeneration will be found.

These electrical signs of recovery have been found to precede clinical evidence of motor or sensory recovery for variable times. In some instances the interval was quite long in one it was 150 days.

CONCLUSIONS

1 The characteristics of responses to progressive currents of long duration during denervation denervation and regeneration are described.

The usefulness of the computation of a ratio for currents of long duration is pointed out.

3 The characteristics of the state of denervation as described are unique for that condition and consist of a minimal threshold amperage for contraction and unity of ratio for stimuli by progressive currents of long duration.

4 A very high ratio or a very high threshold amperage are indicative of regeneration.

5 A high ratio and only a moderately high threshold amperage are characteristic of the degenerating state.

6 The validity of this method of examination for the diagnosis and prognosis of peripheral nerve lesions in man was established by the examination of 5 patients suffering from peripheral nerve lesions. In only 2 cases was there any question of its accuracy and for the first a possible explanation is made.

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THE EFFECT OF COTTON AND CATGUT IN HERNIAL REPAIR ON POSTOPERATIVE TEMPERATURE AND PAIN

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AN Army Hospital offers an unusual opportunity to study wound healing in a standard group of young men who are well fed, well muscled, and otherwise in good health. Therefore an analysis was made of the inguinal hernia operations done with either catgut or cotton sutures at the A. A. F. Regional Hospital, Truax Field. This study was done in order to determine whether any completely objective measurable evidence could be found to support the use of one type of suture material over the other.

The clinical impression that wounds which are closed with nonabsorbable sutures heal more readily than do those closed with catgut is in accordance with the writings of Kocher, Halsted, Whipple, Shambaugh, and Howes, and Harvey, also the clinical impression that cotton excites a less reaction in a wound than does silk is in agreement with the work of Mead and Ochsner.

Direct, completely objective, unbiased measurement of the degree of postoperative reaction excited by certain suture materials in groups of human patients is not practical to obtain. Indirect methods are of value if applied to a sufficiently large, well standardized group of cases. These methods have been used in cases in which wounds have been closed with catgut and cotton sutures by measuring (1) the temperature reaction and (2) the narcotics and sedatives required for relief of postoperative pain.

CASES ANALYZED

Groups of herniorrhaphies, standardized except for the suture material, were analyzed (Table I). Approximately half of the cases were repaired with cotton and half with catgut. No recurrent hernias were included in the series. The differences in average age, height, and weight of patients represented in the groups were not significant (Table III). The operations were performed by a number of surgeons, including residents in training. No one surgeon did enough of the operations in any group to affect the statistics appreciably by his skill or lack of skill. The average operating

time in the cotton and catgut groups was not significantly different (Table III). All operations were performed under spinal anesthesia with 8 exceptions. In 1 general anesthesia supplemented the spinal in 7 general anesthesia was used throughout. The postoperative reactions in these 8 cases are within the normal distribution for the groups and do not affect the final averages.

Following operation, these patients were returned to the various surgical wards without distinction as to the type of suture material used. Because these soldiers were young and in good general health, it was possible to employ routine orders in all cases during the immediate postoperative period. The nurses had no knowledge of the type of suture material used, so the drugs were administered as required by the patient's own subjective reactions. Since the cases were analyzed over a considerable period of time, many different nurses cared for these patients. Therefore, if any nurse had personal prejudice as to the giving of drugs postoperatively, her feeling would not appreciably affect the results in the series. The postoperative temperatures of patients were factual, affected only by the patient's physical status. All patients developing any type of postoperative complication were excluded from the final analysis.

In this study, 163 unilateral and 50 bilateral inguinal herniorrhaphies were reviewed (Table I). Eighty-three of the unilateral hernias were repaired with cotton. Five of these cases were excluded from the final analysis due to postoperative complications which were pulmonary: 1 case upper respiratory infection, 3 cases scarlet fever with secondary deep stitch abscess. Eighty unilateral hernias were repaired with catgut. Eleven of these cases were excluded due to postoperative complications which were pulmonary: 3 cases stitch abscesses, 3 cases wound infection, 2 cases upper respiratory infection, 1 case scarlet fever, 1 case hematoma in the wound, 1 case. Twenty-five bilateral hernias were repaired with cotton. Seven cases were excluded due to postoperative complications as follows: pulmonary, 4 cases; hematoma in wound, 2 cases; stitch abscess, 1 case. Twenty-five bilateral hernias

From the Surgical Service, A. A. F. Regional Hospital, Truax Field, Madison, Wisconsin.

TABLE I — HERNIORRHAPHIES ANALYZED

	Co			Ca gu		
	Unila	l	Bil	Unila	l	Bil
N mbe f cases	83		5	80		
Cases lumina d (pos pera plicas ns) m						5
N tal	3		8	69		
Co d ans l ed busta	5					
Co d la ed (Bass)						3
Co d as l d	3		4			7

were repaired with catgut. Five were excluded due to postoperative complications which were pulmonary, 2 cases upper respiratory infection, 1 case incision into bladder at operation, 1 case mild wound infection, 1 case.

After all cases with postoperative complications were excluded, there remained for analysis 78 unilateral and 18 bilateral hernias repaired with cotton and 69 unilateral and 6 bilateral hernias repaired with catgut. Several different types of repair were done. The type of hernia repair was not found to have a statistically significant effect on the final results in this study.

There was no significant difference in the average age, weight and height of the patients having cotton and catgut unilateral herniorrhaphies. Likewise, the difference in operation time was not striking. The same was true for the bilateral herniorrhaphy groups (Table II).

TABLE III — UNILATERAL HERNIORRHAPHIES
STATISTICAL ANALYSIS OF POSTOPERATIVE
TEMPERATURES

Pos pera da	Ave mpe re		Diff mpe re	Diff and rr	R marks
	Co	Ca gu			
D pe	98	99			S†
	99	99			S
	99	99		93	S
	98	99		86	S
	98	98			S
	98	98			S
	98	98			S

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TABLE II — ANALYSIS OF COMMON FACTORS

Eff m	S ur	A ra	Avera b	Avera b h	Avera ope ng m	h cases
Unil al	Co	5.4	6.6	5.9	44	1
	Ca gu	6		5	5	69
Bil al	Co to		6		86	
	Ca gu					30

POSTOPERATIVE TEMPERATURES

Postoperative temperature curves were determined for each of four groups in order to compare the unilateral cotton to the unilateral catgut herniorrhaphies and the bilateral cotton to the bilateral catgut cases. These curves were determined by taking the highest daily postoperative temperature of each patient in each group until normal temperatures persisted. The average daily postoperative temperature was then calculated for the group. As expected, the average temperatures of the unilateral groups were lower than those of the bilateral groups.

The difference between the temperature curves of the unilateral cotton herniorrhaphies and the unilateral catgut herniorrhaphies was striking (Fig. 1). The average temperature on the first postoperative day was 99.4 degrees F for cotton as compared to 100.0 degrees F for catgut. Furthermore, a normal average temperature was attained in the cotton cases on the fourth postoperative day, compared to the sixth postoperative day for

TABLE IV — BILATERAL HERNIORRHAPHIES
STATISTICAL ANALYSIS OF POSTOPERATIVE
TEMPERATURES

Pos pera da	Ave mpe re		Diff mpe re	(N)	Lev l robs	R marks
	Co to	Ca gu				
D pe	98.6	98.8			3	N5†
	99	99		8		P5†
	99	99				S†
	98	99.6			88	S
	98	99			88	S
	98	99		3		S
	98	98			88	S
	98.6	98		3	88	†

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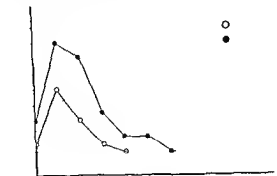
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the catgut cases. These figures are of statistical significance (Table III).

Temperature curves which were similar but of greater magnitude were found in the bilateral hermorrhaphy groups (Fig. 2). The average temperature for the first postoperative day was 99.9 degrees F for cotton as compared to 100.4 degrees F for catgut. Second postoperative day 99.7 degrees F for cotton 100.6 degrees F for catgut. Third day 98.9 degrees F for cotton 99.6 degrees F for catgut. Furthermore a normal average temperature was attained in the cotton cases on the fifth postoperative day, as compared to the seventh postoperative day in the catgut cases. The statistical significance of these findings is shown in Table IV.

NARCOTICS AND SEDATIVES

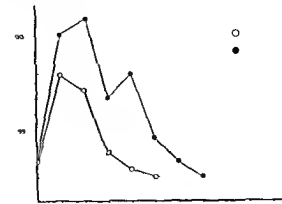
The amount of narcotics and sedatives given postoperatively was now determined for the four

TABLE V—UNILATERAL HERNIOPRIAPHIES
STATISTICAL ANALYSIS OF NARCOTICS AND
SEDATIVES

Narcosis sedatives	A dose per day		Dose mg/kg ()	Dose mg/kg	R mg/kg
	Cotinine	Cocaine			
Cocaine		60	6	6	NS†
Alcohol		4			S†
Benzene			0.0	53	S

*Th
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General Significance of the Study



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groups. This was done in order to compare the subjective discomfort of the unilateral cotton to the unilateral catgut herniorrhaphies and the bilateral cotton to the bilateral catgut herniorrhaphies. The average number of doses of each drug per patient was determined (Fig 3). Patients with unilateral hernias repaired with catgut required nearly twice as much narcotic as those repaired with cotton. It seemed evident therefore that the postoperative course following catgut herniorrhaphies was more painful than that following cotton herniorrhaphies. In the place of narcotics the patients in the cotton group used nearly twice as much sedation as did the patients in the catgut group. This fact was evidence of restlessness rather than pain. The statistical significance of these figures is outlined in Table V.

TABLE VI — BILATERAL HERNIORRHAPHIES
STATISTICAL ANALYSIS OF NARCOTICS AND
SEDATIVES

Narcotics and sedatives	Average amount per tablet		Dose (mg)	(N)	1	Risk
	Co	Ca				
Cocaine		4		4	8	NS†
Heroin	3	8		8	88	PS†
Barbiturate	4		60	8	88	SL

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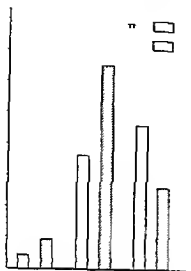


Fig 3 Graph showing doses of morphine required by patients with unilateral herniorrhaphies sutured with catgut.

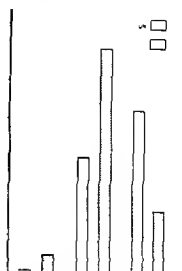


Fig 4 Graph showing doses of morphine required by patients with bilateral herniorrhaphies sutured with catgut.

In the bilateral herniorrhaphy groups the findings closely paralleled those in the unilateral groups. As expected there was a greater but proportionate increase in the drugs needed (Fig 4). The statistical significance of these figures is outlined in Table VI.

EVALUATION OF STUDY

This study of the immediate postoperative convalescence of uncomplicated herniorrhaphies showed that the patients with cotton repaired wounds had less general reaction than patients with catgut repaired wounds. This fact was evidenced by a lower daily temperature and a quicker return to normal by the cotton group. Postoperative temperature is not due to suture material alone. In this study however other factors which might influence postoperative temperature were controlled in the compared groups. The only important difference between the group was the suture material used. There is no way to determine how much of the postoperative temperature in the cotton repaired groups was due to suture material and how much was due to other factors. It is reasonable to deduce however that the statistically significant difference of postoperative temperature in the catgut groups compared to the cotton group was due to the difference in suture materials. As has been shown this difference is definite and significant. These data substantiate the laboratory and clinical findings that wounds sutured with cotton show less post-

operative induration and faster resolution of the induration than wounds sutured with catgut.

The study also indicated that patients with cotton repaired wounds had a more comfortable postoperative convalescence as evidenced by the fact that patients with catgut repaired wounds required more narcotics. In contrast the patients with cotton repaired wounds were able to rest with a sedative instead of a narcotic. These findings are in keeping with the impression that the more marked induration in the catgut repaired wounds was associated with more tenderness to the wound area and increased subjective discomfort on the part of the individual patient.

By the time this series of cases had been completed the surgeons of this general surgical service were in unanimous agreement that wounds repaired with cotton showed less postoperative induration and seemed less painful than wounds repaired with catgut. For these reasons the catgut repair of hernia has been discarded on this surgical service.

SUMMARY

In this study 63 unilateral and 50 bilateral inguinal herniorrhaphies in otherwise healthy young males were reviewed to determine the advantages of either catgut or cotton suture material. All cases with postoperative complications were excluded from the final analysis. There remained 78 unilateral and 18 bilateral herniorrhaphies repaired with cotton and 69 unilateral and 22 bilateral herniorrhaphies repaired with catgut.

A comparison of the postoperative temperatures revealed that patients with unilateral or bilateral herniorrhaphies sutured with cotton averaged a lower daily postoperative temperature which returned more quickly to normal than patients undergoing similar procedures in which catgut sutures were used.

A comparison of the postoperative narcotics and sedatives administered revealed that the patients with unilateral and bilateral inguinal herniorrhaphies sutured with cotton required less narcotics than patients undergoing a similar procedure in which catgut sutures were used. The patients with wounds sutured with cotton required more sedatives.

The presented data support the clinical impression that patients with wounds sutured with cotton material showed less postoperative wound reaction and were more comfortable than patients whose wounds were sutured with catgut.

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5 Id m S g y 94 7 485 5 3
6 SHAMB P S g Cyn Ob t 937 64 765
7 WHIR A O A S g 933 98 662

PARA ARTICULAR CALCIFICATION (PELLEGRINI STIEDA) IN AFFECTIONS OF THE KNEE

I WILLIAM NACHLAS MD L t t C! I MC AUS B ltm M y l d d
JOHN L OLPP MD M J MC AUS E l w d New J v

THE existence of anomalous calcifications medial to the lower end of the femur has been known for a number of years (3, 4). Though this condition was originally considered to be a rarity, recent reports indicate that it is not uncommon. The nature of the mass, its origin, its exact location and the proper manner of treatment have all been subject to many opinions.

Opportunity has been presented to us to study carefully a rather large number of patients with such calcific deposits. Within 6 months, 30 men have been sent to us for examination and treatment for this condition. It has been possible to make careful clinical and roentgenologic studies of these patients. In addition, we were able to obtain 1 specimen at operation and laboratory studies of this specimen have been made. Finally, dissection of the pertinent area in 9 cadavers in 1 fresh knee at autopsy gave us the opportunity to establish some interesting facts relative to the pathological anatomy.

PATHOLOGIC ANATOMY AND PATHOGENESIS

There has been considerable controversy as to which tissues are involved in the formation of the calcified mass. The tibial collateral ligament, the tendon of the adductor magnus muscle, bursae, the periosteum, and the bone itself have all been considered. A careful study of the roentgenograms has been helpful in locating the calcification.

Roentgenographic examination revealed these calcified masses to be situated in the soft tissues on the medial aspect of the knee directly overlying the adductor tubercle (Fig. 1). In a few instances they seemed to be continuous with the bone proper. In the cases in which we changed the position of the knee slightly and took new roentgenograms, we could demonstrate that the adductor tubercle existed between the condyle and the calcareous mass (Fig. 2). The translucent layer is thin usually less than millimeter in width. The calcification is difficult to see on a late view of the knee joint, indicating that it is not very dense or thick. The level at which it is noted that the adductor tubercle somewhat posteriorly.

to the bony attachment of the tibial collateral ligament and distal to the area in which the tendon of the adductor magnus is fixed. The shadow may appear as a short straight line. When it is more than a centimeter in length it appears to have the shape of a curved line and is more or less parallel to the curve of the tubercle. Further length of the line is usually acquired proximally and is formed by a reversal of the curve so that on roentgenographic examination of the right knee it has the shape of a flat letter S. The newly formed curved portion is somewhat further from the cortex of the bone than the original straight part. These facts indicate to us that the tissue in which the lime salts are deposited is not part of the bone but overlaps the tubercle fairly intimately so that it is continuous. When the length is greater its proximal portion curves gently; the opposite direction to be parallel to the concavity of the bone contour above the condyle.

A more direct examination of the involved structures was permitted by the findings at operation. The skin incision which ran longitudinally over the adductor tubercle was carried through the subcutaneous fat to the fascial layer. This was then incised to expose a white fibrous membrane that seemed to invest the medial aspect of the condylar epaision of the knee. It covered the tibial collateral ligament, the adductor tubercle, and the attachment of the tendon of the adductor magnus. When incised at the level of the adductor tubercle the undersurface of this layer was found to be adherent to an osseous button like plaque that was apposed to the tubercle. It was molded over the tubercle and the bone (Fig. 3). When the bony plaque was removed the tubercle was found to be somewhat less polished in appearance than usually is but it was covered by a thin periosteal layer. No connection could be found between the dissected area and the inside of the joint. Indeed, when in the course of the operation the joint was entered it was observed that about 2 centimeters separated the uppermost medial part of the inner joint space from the area exposed by the incision. If the mass is present there is the capsular layer that surrounds the synovial membrane was adherent to the inner aspect of the femoral



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condyle below the level of the adductor tubercle and that over this there ran a layer of tissue which covered the tibial collateral ligament the adductor tubercle and the adductor magnus tendon (Fig 4)

An attempt was made to identify this outer layer in standard textbooks and atlases on anatomy but most of these references are rather brief in their descriptions. Because of this dissections were made on routine cadavers in the anatomic laboratory.¹ It was found that beneath the fascia lata there existed an aponeurotic layer that hugged the medial aspect of the knee rather closely covering the tibial collateral ligament the adductor tubercle and the tendon of the adductor magnus. This membrane was not firmly attached to the underlying tissue and indeed seemed to glide over it. When the knee was fully extended and forcible abduction was attempted the aponeurosis as seen to glide distally over the tubercle. The amount of movement was not great but a pin stuck through the layer and anchored in the periosteum was clearly tilted distally by this maneuver.

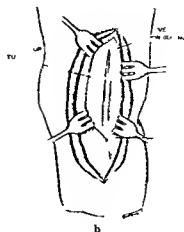
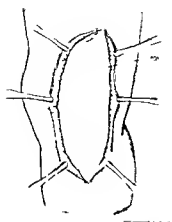
Dissection of a knee at autopsy immediately post mortem revealed similar structures but indicated more accurately the state of the tissues. When the fascia lata was incised and retracted the membrane that covered the medial skeletal structures of the knee was found to be glistening and white. Three small veins ran parallel to each

other within the membrane coursing longitudinally from the upper part of the incision over the adductor tubercle to disappear in the deeper structures at about the level of the knee joint. The membrane glided easily over the underlying tissues and could easily be dissected off to expose the tibial collateral ligament the tendon of the adductor magnus and the clear polished adductor tubercle covered only by its periosteum.



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The location of the Pelles in St eda calcifica-
tion is thus clarified. It is formed directly under a
membrane that overlies the lower femoral condyle
on its medial aspect. Lateral to it is the peri-
osteum of the adductor tubercle. When the cal-
cific mass elongates it tends in a proximal di-
rection so that it lies between the tendon of the
adductor magnus and the overlying membrane.
The condition is not due to a fracture of bone
from the femur, a tear of the periosteum or a
calcified bursa.

Statistical reports based on our cases are likely
to be misleading since our group of patients does
not constitute a fair sample. Our patients are all
soldiers and are generally young male adults.
Most of them had been examined previously by
radiation when acute trauma is prevalent.
Only a small percentage of the knee cases in these
units are referred to us. Nevertheless it is possible to
make some hypothesis as to the formation of the
lesion by considering the history as a guide to the clinical
findings.



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The calcification has generally been attributed to an injury consisting of a twist of the knee joint. In our patients an attempt was made to determine if the condition was developed with or without an injury. If an injury had been sustained the patient was asked if he had had a direct blow or an indirect trauma such as a twist of the knee joint. The histories were not entirely clear in all cases. Six patients gave histories of sprains or twists of the knee but only a few of them recalled in what direction the leg was forced. Two patients reported direct blows on the joint but of these only one indicated that he was struck on the medial aspect of the knee. Three patients had had twists with apparent recovery but later sustained direct blows in automobile accidents or when falling on their knees on the obstacle course. Two patients denied having had any injury whatsoever. Their knee complaints constituted only a part of a polyarticular arthritis. Two did not recall any injury and in the remainder the records are not clear. It appears therefore though major trauma is found in most of these cases that it was not the indispensable agent in the production of the condition. It is significant that in all of these patients there was evidence of arthritis in the adjacent knee joint. Examinations revealed thickening of the capsule occasionally there was fluid increase and on rare occasions there was limitation of motion. All roentgenograms showed the bony lappings that are considered manifestations of arthritis. Since these changes are not produced immediately after an injury it must be deduced that joint inflammation had been present for some time prior to the precipitating injury. Indeed one was able to obtain from the patients the history that the knee joints had been troublesome for months or even years before the examination that revealed the calcific masses. The pains in the knees were chronic some being attributed to a weak joint while others were considered rheumatic. Since chronic inflammatory involvement of the knee was always coexistent it deserves consideration as an etiologic factor. Though the calcified mass is outside of the joint the hyperemia associated with the inflammation of the joint proper does affect the environs and so supplies an important liaison between the two areas of pathology.

The element of trauma may be supplied by a single severe tear but may also be the result of cumulative wear and tear produced by friction of the membrane as it glides when the joint moves. Since the adductor tubercle projects medially it must form a local factor irritating the fascia that moves over it. Any abduction of the knee joint



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must produce a strain on the membrane particularly where it stretches over the promontory of the tubercle. The area under consideration is thus vulnerable to degenerative irritations as well as to tearing strains. On the other hand the frequency of ruptures of the supportive structures of the knee on the medial aspect without the subsequent development of the Pellegrini Stieda complication leads one to question any hypothesis that the rupture alone can produce this complication. Furthermore in none of our cases was the injuring force of such magnitude that a major laceration of the medial soft tissues took place. In none of them did the sprain lead to an instability of the knee that would suggest a major lack of support on this side. Even the more severe twists were strains rather than severe sprains. All of these factors make us believe that the series of events leading to the formation of a calcific deposit is as follows. A process of attrition takes place on the inner aspect of the gliding membrane over the critical point namely the adductor tubercle where friction can most easily be obtained. This process may have its origin in a series of small traumas that do not attract much attention. The process of attrition will be speeded by the swelling of the tissues that is induced by either polyarticular (systemic) arthritis or local traumatic arthritis of long standing (Fig 5). As a result of the degenerative process affecting the undersurface of the membrane the tensile strength is reduced so that a relatively moderate injury may cause an incomplete tear. This rupture is associated with a laceration of small blood vessels such as we have seen



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in our dissection and permits a moderate amount of bleeding to take place. The tendency is not of such magnitude that a large hemorrhage is formed or that the open avenue of escape for the bleeding through fascial planes. The small hemorrhages are trapped locally and molded in its position by the outer coating of the membrane. The encapsulated hematoma thus formed undergoes degenerative changes which under the proper physical and chemical conditions lead to the calcification. The exact nature of the conditions has not been

demonstrated in our cases. It has however been shown elsewhere that blood contains within itself the elements that are necessary to produce calcification in areas where the calcium and phosphorus concentration is adequate and where a relative alkalinity exists. The blood cells and plasma have within them acid esters of phosphorus as well as the phosphatase that is necessary to convert them into inorganic phosphate. Whatever the theory for local calcification may be the fact remains that calcification of hematomas is a well known occurrence.

rence. An early step is the leposition of lime salts in the form of calcium phosphate granules. The granular nature of the shadow is shown in our roentgenograms. Under some conditions of repair this unformed granular mass can be absorbed. In other instances however there is a gradual organization of this mass that leads to the formation of bone (Fig. 6). This phase too is demonstrated in our serial roentgenograms (Fig. 7). The specimen we were able to examine represents this stage (Figs. 1 and 3).

We find many analogous circumstances in the shoulder where similar lesions occur. These have been intensively studied. The supraspinatus tendon running as it does over the head of the humerus is subjected to a considerable amount of friction as the result of the movement of the arm. In spite of the intervening bursa there is a great deal of attrition going on in patients who use their shoulders excessively. The degenerative changes affect not only the bursa but also the adjacent surface of the tendon. Incomplete tears of the tendon have been demonstrated in many instances. The precipitation of lime salts in these areas is by no means uncommon. At first there is a soft creamy mass which becomes gritty at a late stage and not infrequently becomes organized into definite body of bone. Microscopic examination of the tissues before organization has taken place reveals that there is a low grade inflammatory process in the soft tissues in which the precipitation takes place. We believe that the process of calcification at the knee joint is quite similar to that of the shoulder.

SYMPTOMS AND PHYSICAL FINDINGS

It is rather interesting that when our patients were asked to localize the pain in the knee they pointed to the area just below the patella. None of them indicated the region of the adductor tubercle. Since we did not see them immediately after the injury that led to the calcification on them we were asked if they had had pain near the tubercle. None of them recalled any acute discomfort in this area. Many of them had some discomfort in the knee at the extremes of extension and flexion. Some of them had an ache that was present particularly on weather changes and when they first arose from a sitting position. Other complaints included prolonged walking made the knee hurt. On examination one could feel the thickened capsule and an occasional loose fluid increase. Pressure over the articular edge of the tibia produced pain in every case. Palpitation of the adductor tubercle revealed some local fullness which felt bony in character. When compared to the corresponding

area on the unaffected knee there was a distinct though not large bony prominence. In none of our cases could we move the calcified mass over the underlying bone. Pressure on this area gave discomfort in about half of the cases but at no time was tenderness great. We believe it possible to recognize clinically the existence of such a calcified mass in a large percentage of the patients if in addition to the usual examination procedures for injured knees we add careful palpation in the region of the adductor tubercle. Of course after the local lesions have become radio-opaque roentgenographic examination will reveal their existence.

TREATMENT

Since the calcified mass is extra articular and is so situated that it does not irritate tissues within the joint proper, the knee joint and the Pellegrini Stieda calcification must be treated independent of each other. The articulation constitutes a problem that is not germane to this paper and must be treated on its own merits. The calcified mass in our group of cases has not been a significant source of discomfort to the patients. It is conceivable that in the acute stage there may be an appreciable local irritation associated with the newly calcified bone and lavage of the precipitated lime salts may prove as valuable as it does in the shoulder calcification. We have had no experience with this procedure. Physical therapy in the form of local heat may have some value in clearing up the calcification having been given to 2 of our patients in whom the lime salts disappeared. Roentgen therapy likewise suggests itself as a therapeutic measure though we have not applied it in these cases. Surgical intervention is in our opinion rarely necessary. Inasmuch as the symptoms connected with these are relatively insignificant it is conceivable that if the mass is large enough to cause increased irritation on the investing membrane further attrition of this layer at the critical point may take place. In such circumstances removal of the plaque may be indicated. If surgery is contemplated one must recall the injunction made by Kulowski not to add the trauma of surgery to the area before the calcification and organization have been complete. Otherwise one may find a return of calcification in the scar of the operation. In our patients the only one that was subjected to operation had the bony mass removed because an arthrotomy was necessary for the removal of a joint mouse and the Pellegrini Stieda calcification could be removed at the same time without much trauma. Eleven of our patients were returned to full active military duty. Those who were not were separated from the service for

reasons other than the calcification. Since only 1 of our cases had the calcified mass removed and since all had been given an opportunity to exercise the extremities before they were discharged from the hospital we feel that the Pellegrini Stieda calcification does not entail any appreciable disability.

COMMENT

The imposing name of Pellegrini Stieda disease is misleading. It implies that the one finding of the calcification of the adductor tubercle is a disease complex. The stress that is given this particular manifestation tends to detract from what is usually the significant part of the patient's disease, namely the arthritis of the knee joint. Furthermore because of the visualization of this anomaly there has been a tendency to associate the symptoms of the affected knee with it. This belief has led to surgical intervention for the removal of the mass. In our opinion such an approach to the problem is inaccurate in that it stresses a relatively innocuous manifestation and tends to overlook the major disabling factor.

SUMMARY

1. Twenty patients with calcification over the adductor tubercle are reported and the operative findings in 1 case are described.

2. A description is given of anatomic dissections and 1 autopsy exploration of the area under consideration. These studies revealed the existence of a membrane which we consider an important factor in the formation and shaping of the calcified mass.

3. The coexistence of chronic arthritis of the knee is stressed.

4. A hypothesis as to the etiology of the calcification is presented.

5. Attention is directed to its relative clinical insignificance.

6. Conservatism in treatment is stressed.

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THE NAR PALSY DUE TO COMPRESSION OF THE MEDIAN NERVE IN THE CARPAL TUNNEL

R B ZACHARY FRCS O f o d E g l d

In 1909 Hunt described a curious syndrome characterized by gradual atrophy of the radial part of one or both thenar eminences the result of paralysis of abductor brevis and opponens pollicis. The short flexor of the thumb is usually spared there is no fasciculation the reaction of degeneration is present in the affected muscles and the condition never involves the interossei or hypothenar muscles. Sometimes there is subjective sensory disturbance in the tips of the digits but usually no demonstrable loss of touch or pain sensibility. The patient is usually middle aged or old.

Hunt 1909 1911 described 3 cases and regarded them as occupational palsies due to repeated firm pressure on the branch to the thenar muscles at a particularly vulnerable point where it turns forward over the lower border of the anterior carpal ligament. Wartenburg (1939) challenged this theory because of its incompatibility with Saunders finding that the median nerve motor branches are nearly always covered by a slip of muscle either flexor or abductor pollicis brevis.

Marie and Foix (1912) in describing a series of cases of isolated muscular atrophy of the hand mentioned one which tallied exactly with those of Hunt but they ascribed the condition to syphilis since the patient had lightning pains in the leg and the ankle jerks were absent. There were no other signs of central neurological disturbance. Later (1913) they performed a necropsy on a patient suffering from a similar paralysis unfortunately it had not been possible to test sensibility satisfactorily since the patient was over 80 and hemiplegic. They found a neuroma on the median nerve just proximal to the anterior carpal ligament and a constriction of the nerve trunk beneath the ligament. Histological examination of the neuroma revealed a decrease in the number and size of the myelinated fibers and a noticeable increase in the interfascicular connective tissue. At the site of constriction there was gross fibrosis within very small bundles and distal to this complete degeneration of the fibers.

Brouwer 1906 recorded 15 cases and favored a phylogenetic explanation. He suggested that

the thenar muscles being recently acquired characteristics are more susceptible to trauma and under adverse conditions more liable to undergo degeneration than other muscles.

Harris 1926 mentioned wasting of abductor brevis and opponens without sensory loss as a complication of arthritis of the trapeziometacarpal joint.

Lhermitte and de Massary 1930 recorded the necropsy on a patient suffering from this syndrome in which there was atrophy of the dorsolateral nuclei in the sixth and seventh cervical segments of the spinal cord.

Dorndorf 1931 described 16 cases all women at or about the menopause—a factor which he considered significant. He suggested that there was a toxic neuritis affecting motor fibers more than sensory.

Moersch 1938 who added 1 case supported the view of Hunt that the motor branch is injured as it passes over the distal edge of the anterior carpal ligament.

Wartenburg 1939 presented 7 further examples. He dismissed the possibility of median nerve compression because nearly all the recorded cases affected only the outer part of the thenar eminence and there was seldom any sensory disturbance. His views are similar to those of Brouwer.

Woltman 1941 reported 2 cases of thenar palsy 1 of which had slight sensory loss in the median area and was associated with acromegaly. The other a woman of 71 with arthritis of the wrist had a complete median nerve lesion with motor and sensory loss. She made a perfect recovery after section of the anterior carpal ligament by Learmonth an indication that the paralysis was due to compression of the nerve trunk. He suggested that the nerve may become compressed by an increase in intraneural connective tissue as in acromegaly or by narrowing of the carpal tunnel due to peritendinous thickening.

The explanations of the thenar palsy offered in these papers can be summarized as follows (1) pressure on the motor branches of the median nerve at the distal end of the anterior carpal ligament (2) phylogenetic susceptibility of the thenar muscles (3) compression of the median nerve in the carpal tunnel and (4) a spinal lesion.

From the Department of Orthopaedic Surgery (Physiology and Clinical Orthopaedics).

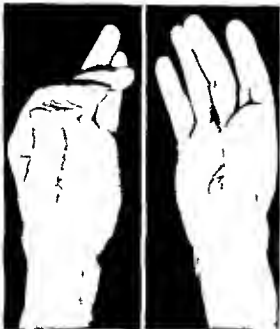


Fig. C. Bilateral incision lines for the first dorsal and first palmar web spaces.

Evidence is strong in favor of the third hypothesis yet the cases cited in support of this view were not proved to be identical with the others although there were similarities. The following 2 cases are presented because they showed predominantly motor lesions only the radial part of the thenar eminence was affected and in both

it was clearly proved that the median nerve was compressed in the carpal tunnel.

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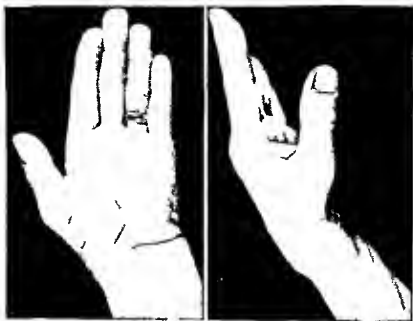
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Fig. D. Bilateral fractured carpal scaphoid with osteoarthritis of wrists.



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DISCUSSION

It has been shown that various authors have postulated lesions of the motor branches the muscles or the anterior horn cells but rarely the main trunk of the median nerve to account for the almost purely motor character of the lesion and the inclusion of the short flexor of the thumb.

The spasm of the short flexor is easily explained. In common with many other workers Hunt 908 recognized that the thenar muscles may be partially supplied by the ulnar nerve although Wartenburg did not accept this view. More recently it has been shown by Herbert 943 that in about 3 cases of 4 the flexor pollicis brevis receives part or all of its nerve supply from the ulnar nerve. An examination of many more patients by us has confirmed this finding. In a high proportion of median nerve divisions flexor pollicis brevis is still acting. That this was the state of affairs in the 2 cases described was shown by faradic stimulation of the ulnar nerve and a similar explanation is likely in the previously reported cases. But it is not surprising to find that in some instances e.g. Woltman's case and some of those cited by Dorndorf all the thenar muscles were affected since there is a minority of subjects in whom flexor pollicis brevis is supplied entirely by the median nerve.

The second source of difficulty in diagnosis is the almost complete absence of sensory disturbance. This has led previous authors to incriminate the motor branches of the nerve (Hunt) the muscles themselves (Brouwer and Woltman) or the anterior horn cells (Lhermitte and de Massa y). Another explanation is possible. It is known that moderate trauma may affect a nerve selectively so that one function is suppressed with little or no change in others (Stopford 926). Recently Sande and Seddon (unpublished work) have shown that in action injuries the larger fibers—motor and proprioceptive—suffer more than the smaller ones and this dissociated type of lesion is frequently encountered in peripheral nerve lesions from many causes.

In Case 1 there was a mild sensory disturbance at the finger tip whereas in the other there was no demonstrable sensory disturbance at all yet in both the site of the lesion was undoubtedly the main trunk. Moreover, absent sensory disturbances were present in one of Hunt's 3 cases

and in 5 of 7 of those reported by Wartenburg in which there was demonstrable mild impairment of sensibility.

In patients presenting this syndrome there are therefore good grounds for suspecting a lesion of the main trunk of the median nerve and the possibility of compression of the nerve in the carpal tunnel must be borne in mind.

The cause of the compression may be quite obvious as in the case of the malunited Colles fracture and a number of examples of this have been recorded. Most of these lesions followed the injury within 1 or 2 months (Bouilly 1884; Lewis and Miller 192; Abbott and Saunders 1933) and the sequence of events was then quite clear. In only a few recorded cases did it occur as a late sequel. Abbott and Saunders reported one example occurring many years after the injury and quoted two others.

Fractures of the carpal bones especially the scaphoid are a fruitful source of osteoarthritis of the wrist and if there is much peripheral swelling narrowing of the carpal tunnel is ultimately inevitable.

Several of the cases reported by Brouwer and Dorndorf and one of Woltman's had arthritis of the wrist.

It is possible that other factors may produce the same state of affairs but there is undoubtedly sufficient evidence to demand a careful investigation of the local condition in every case of this syndrome if only to exclude compression of the main nerve trunk in the carpal tunnel.

The early release of the nerve by division of the anterior carpal ligament may lead to recovery of motor power but if the paralysis and wasting have been present for many years it is unlikely that recovery will occur since the changes in the muscles will have become irreversible. The contrast in the cases presented is very striking. In Case 1 the paralysis had been present for 14 years and there was no sign of recovery 3 months after operation. In Case 2 the symptoms had been present for only 15 months and within 2 months of release the nerve abductor pollicis brevis had recovered.

SUMMARY

Two cases of the syndrome of partial thenar atrophy are presented.

The paralysis was due to compression of the main trunk of the median nerve in the carpal tunnel.

3. The partial nature of the atrophy is due to ulnar innervation of flexor pollicis brevis.

4. The almost complete sparing of sensory fibers is probably due to the selective action of the

trauma affecting the large fibers (motor) pre dominantly and producing a dissociated type of lesion

5 Division of the anterior carpal ligament is suggested as a means of relief

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dered from celomic epithelium is potentially capable under certain conditions to undergo metaplasia and produce mullerian like ducts and tubules. Weller expressed a similar view and stated that the subserous stroma cells of the peritoneum could form masses of decidua about these heterotopic gland structures. Schiller (39 40) stated that in early fetal life the entire peritoneum is potentially able to form endometrium but in the course of normal development only the peritoneal cells in the mullerian region retain this potency which may remain latent for years and then as a result of stimulation may be activated and form regions of endometrium within the peritoneum. Halban Schindler Carere Comes and others concluded that endometrial tissues migrate to the lymphatics draining the uterus during menstruation and are carried to extrauterine locations. Sampson (33 34 35 37) has proposed that a retrograde flow of menstruation products occurs. The cast off viable endometrium he stated is implanted throughout the pelvic peritoneum. According to Sampson endometrium is displaced also through venous and lymphatic channels more frequently by the veins than the lymphatics. Goodall believed that endometrium becomes invasive as a result of faulty ovarian secretion but stated that lymphoid tissue and tissues outside the pelvis are unsuitable for the growth of heterotopic endometrium. H. O. Jones stated that these heterotopic tissues may come from either the superficial two-thirds of endometrium or the basal layer and that specific physiologic changes occur more readily when the more responsive superficial layers are involved. Possibly some of these heterotopic tissues may be

more immature than others and hence incapable of functional activity and decidual reactions occur in stromal cells of the heterotopic endometrium only after functional maturity has been reached.

Gland like tissues in lymph nodes of the mesentery near the pancreas in the neck and around the salivary glands according to Carere Comes may come from embryonal displacements of tissues. Sternberg said if endothelial proliferations in lymph vessels lead to epithelium like formations it would be difficult to believe that such a transformation should confine itself to the border sinuses of lymph nodes without changes in the endothelium elsewhere. He concluded that epithelial cells from these glands migrated through the lymphatics to regional lymph nodes and formed small glandular inclusions.

CONCLUSIONS

Heterotopic endometrial tissues with decidual reaction of the stroma cells were found in a pelvic lymph node of a woman who died from the hemorrhage caused by a ruptured extrauterine pregnancy.

The decidual reaction of the stromal cells in these heterotopic tissues indicates that these tissues during the term of pregnancy have the physiologic changes of endometrium in the uterus.

Of the theories proposed as to the origin of heterotopic endometrium none as yet has been accepted generally. Probably the factors involved apply also to the origin of glandular structures observed in lymph nodes in other regions of the body.

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GASTROSTOMY

FROM a survey of the large number of operative techniques developed for the performance of a gastrostomy one might gather that a large field of usefulness existed for this procedure. Undoubtedly the most common lesion for which this operation is performed is a carcinoma of the esophagus especially of the middle third where the majority of these neoplasms are located. Our experience at the Cook County Hospital has given us reason to reconsider the entire problem.

We have reviewed the records of 80 patients on whom gastrostomies were performed between 1941 and 1944. There were 72 males and 6 females, a frequency in females higher than that ordinarily reported. The ages varied between 51 and 81 years. The classical symptoms of dysphagia, inability to retain liquids and solids, and weight loss were uniformly present. Of particular interest was the average weight loss of 36 pounds in this series of patients. This implies the loss of 16,000

grams of tissue, the most important fraction of which is tissue protein. X-ray examination or esophagoscopy or both usually have demonstrated the lesion before operation. The middle third of the esophagus is involved most frequently, the lower third next, and the upper third the least frequently. Almost one half of these patients show a secondary anemia when admitted to the hospital. It is certain that the incidence of anemia would have proved to be higher had blood counts been repeated after dehydration had been combatted. In another series of cases previously reported in which patients required various surgical treatment, an incidence of hypoproteinemia of 23 per cent was found. Hypoproteinemia was considerably more frequent in this group of cases; here again the actual incidence would have been still higher had dehydration been taken into account.

The usual preoperative preparation consisted of the use of antispasmodics, liquid diet where possible, and parenteral fluids and vitamins. Twenty-six of the 80 patients received blood transfusions and in no case was more than 500 cubic centimeters given. The operations were performed by several members of the attending and surgical staff. A variety of anesthetic agents were used; local anesthesia or intercostal block was favored. Average operating time was slightly over one hour. The types of gastrostomies performed included those described by Janeway, Witzel, Spival, Thorek, and Glassman.

In many instances the gastrostomy was performed with the hope that resection of the esophagus could be accomplished at a later date. Actually, resection was done in only one patient, and in this instance it proved to

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August, 1945

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F r t l ty d A d g n E tu f N m fly
H d d llyp trich t c Wom
HUNDLE J M Jr d Di nt W K Th l fl
en J Cyn cl on D d the Unn ry
Syst m
DOVIST H Roe tg D gn s f Ut E do-
m t s

OBSTETRICS

Pregnancy and Its Complications

STUD IRO W E C rical Pr gn cy
B e J d B owce F J Blood Pes ur d
th f d f Hypert N llyp
d P W m R i tu t th R m t
P gn s f th T m as of P y
S M D WEXLE G T OM E W d
A HE H A Th Rap d T tm t f E ly
Syphili D ng P gn cy
RICE P M se Infecti P gn cy
HAY J L Acut Ant n Ph my lit D g
P gn cy
McL A M B Ext l E d m tr s d
P gn y AR port f Cas
F M VISO H A L vi L M E N d
H P P pill y Les f th C r Ut n
in P gn cy

Puerperium and Its Complications

✓ HAN J L Sp l A th s Th py C
f P l p t m Ut n At y
B J D s R d D P O B I
d tu f llyst ect my in P gn cy d th
Pu rpe m

Newborn

St f LA f A d L TE U
H m lyt D On D yg t T
S AR H V U R A Ep d m f P mph gu
C tagos Neo torum w th v n f d Spec fi
B call
SW ALPE CE V D oden l l th Newborn

Miscellaneous

HARRISO C V d ME. COCK F C Th v l
l th Rh s Test Ob t t cs
T R. Th Ind f th Pla tal St
F tal P ese tati
H MBUR C C tribu t th H rm l D
gn l llyd t f m M l d Ch p th
h m B d 76 Ca w th H rm l An t
yse
Str c R. d D v q o N Eff ts f an
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H K H J W d R f L
Ch n Strid E ly L f D t P r s t t
Right A t A b
v LL J L d S ch m o r E R Wh l f l
AN w M thod f E l u g P ph t
Vascul D se
Cv t k I S N H R L d W v k l I A
t n l Sp m Sec d ry t L gat d R to-
grad I ject fth S ph v
R v w H Th mbophl b t fth Lat l
S
AND LL P O Th mbos fth I t m l C t d
Art ry
J R d H H H S g y f D p
V Thr mb fth Low E t m ty
LL M A H d L O R D J W J AN
t M thod f Blood Ves l An t mos
Expenm tal d Clinical St dy

H d Tran f n
TR ITON F LA LE F A d Li TE U
H m lyta Disease O Dizyg ti Tw
LE TELL H H d GUNTRE L St dies f Plas-
m v lum th H m B g C m p t
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gical Shock

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Th T tm t f L m w th A t f f Ra
di tu Sod m

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S w H G d R LH G E Cranio-
b l w W d Ob rv t D layed
T tm t
Sm v Th Med l C rp R d A my Op-
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W KE R M d H CH W R S Ab-
d m l l j n t th B H p tal
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ment fCa ci m ith Beat
H YL N J On Imp ving th R suits of T at
ment Ca ce ith Collum Uteru
JAN V G Roe tgc T tm t dth C rs of
C f G T C l T m r th Os Sy tem
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Mis lano s

THY ESPY J E VIDE AE A d V LAUM I
Th T tm t fL m th A th l R
d tu Sodium

MISCELLANEOUS

Clinical E tite —Gen al Phy i log cal C d tu
B CH G E d WINSOR T Th R l t f
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f m the Ski d Lungs f l m S bjct
S btrocal Clm t
W LEE J JR d SHENKIN H Studies th
Tox m Synd om Alt r B rns Ce tral V rv
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McLA M C W d HOLL d J L S lt
W t Ulcers f th E trms ties Ther O cu
Jap se Surv
Do W L d NIP ER P H Chneal Aspect
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ENGLEROR T D d W LMAN W F Fl nas s
S ld s Il d the S th P cfi
SMITH F R J Fl nas A St dy f 737 P t ts
So D gnosed
CRAI W M T MPSON G J HYTE A M
BAR LE E E and Oth rs P n s lls A
P gtes R pot
W LOHA M B d C T t c W C A S nopl
Tech q f th F tmst f P m lls th
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E t J C 05	Kuh C 77	S guly J 3	Winso T 68
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ABSTRACTS OF CURRENT LITERATURE SURGERY OF THE HEAD AND NECK

HEAD

G L and L H d M ttram M E Traumatic
Pn umocephal R d l 1945 44 37

Pn umocephalus occurs most frequently following fractures involving the skull and meninges. On rare occasions it is the result of gas formation of an intracranial tumor which has eroded into the nasal sinuses.

Its mechanism is explained on the basis that with coughing sneezing swallowing and blowing if the pressure in the sinuses forces a drop of mucus momentarily increased. This forces a through the site of the fracture into the cranial cavity. The mucus collects in the subarachnoid space subdural space brain vessels.

The usual cause is usually a fracture of the posterior ethmoidal and sphenoidal cells often

being accompanied with meningitis whereas the subdural air is more apt to follow fractures through the posterior walls of the frontal sinuses. The air in the bony substance or entricular system depends on the extent of adhesions located on the fracture and amount of external pressure. It is often associated with subdural air.

It is interesting that pneumocephalus as a rule develops after a latent period of several days to several months. Da dy called attention to this fact in 1906 when he reported series of 4 traumatic cases. In only 6 of these was there a pneumocephalus before onset of the case occurred before examination between four and six weeks and five after the test being after ten months. The reason for this is not clear but the authors are under the impression that the hemorrhage and edema which immediately follow the trauma prevent the passage of



Fig. 1. Roentgenogram of the skull base showing a fracture of the ethmoidal and sphenoidal cells. The fracture line is visible through the bone.

air into the cranial cavity Lat especially when the patient b m very activ th ha c s f r fo g the air thro gh th as yet non t d fra tu l ues b me c n s der hly g t r The f c to which p ced es th crudesence of sympt ms s not infre qu tly blowing of the n se n ing r unusual activ ty at t mes a o iated with th flow fa clear f d f om the nose Wh ther the sympt m a e mld or as m e often th case of an mc ing sev ty system t e r entg nograph c examination f th kull wll establ h the diag o s w th ut d ffi culty

The mo tality rat is u d 40 per c nt death usu lly bei g du t menun t Surg cal int rve t n with cl su e of the dural wound s indicat d n th prog ve cas

Th authors rep rt on f their own eases n whi h pa un cephal f flow d h t g in th ght tem p ral g n in s c d l t t mpt Th h otng curred n Sept mb r o 1943 The first e tgen m at on made on Oct ber 6 943 rev l d mul tipl m tall f agm nt scatter d l g the p th f the bull t in th f talloh area nd there w the xpect d tellat f actures t the pont f entry d t f th h llet hut no intracran l r c uld b d m nat t d On N vemh 6 943 the pat t devel p d ft r blowing of the nos tw sev but f h d he iated with vomit g a d e t g n e e m ation f th kull ow h ed f am u t of r n b th l t l vent cles nd om th th rd nd fou th t l s asiv ntricu lography h d he n perfo med Th re w also larg c llet n of r n th subd l sp f th ght f tal ea n ar th eg on f th fract th ough the t r o f ss Th p t nt w pl d b d nd h c v d completely A th d ro nt g n m at nt n days l t show d only a t ce fa ma ing th lat l vent cle dn ar t all w s o berved in the s bdu l pac

T L reem MD

Th ma K H F ctu and Fra tu D locat n f th M ndibul C ndyl AM thod l Open R d ct n nd Int n l Wiring nd On l Sk l t l Fix ti n with a R port f 32 Cases J O I S g 945 3 3

This t cl g s hsto cal vew f th t eat m t of ndylar f t a d cl ficat of f ctu s w th d pl cem ts d f t re d s loca t n

Th diff r nt m th ds f t tm nt a dis c ed m ly nt m xillary mmob liz t n by l gat f nt l t m t d mbuat n f fixat n nd f nt n l t eatme t R po ts n th r l t f the m th ds en m r t d

Th results well th m r t s own p ce b n t th f t that th es l t btam d by the p tes c on rv t v t tm t not s good susgen lly bel d O th trary b th majo fun to l d t b and man r complcat n uch a p in and limited m t w th m l ccl n e qu te commo complaints l t It w s

p inted ut that a chldre spo ta cous readjust ment of th mand bular j nt ep physcal gro th of th dyl d p s t g f th teeth will m tm g tly d th c r r c to of m r defects that a e p s nt after t tm t h t th t adults better results can h bta d hy operative pro ced res

A method of op n d t w th fixat on by int n l wiring was advocat d f ca es which there w s w d separation of th f gme ts w h ch d posed to no r m k d d a d d place m nt of th co dyle which w ld l t sh r te g f th ramu and a op n b t

There i n a lysis of 3 ca s f condyl fra tures treat d t the Massach tts Gene l Hl p tal B t du g the past eghtee mo ths hch sh w d the foll w g cond t s

Numbe f fractures

C dyla

S bco dyla

Right co dyl

Left co dyl

N d pla m t f dyl

Displa m t lat lly

Displacem t medially

F ct dislocati n, m dually

S bluxat

C m pl t disl catu

C m pl t d l odem t

D locati f p r t f dyl

Fract d l catu f ra d

Fra t d l catu w th displa ed m nscu

Old f act w th pseud thr

W th nkyl

Numb f p u ts

M l

F m l

Fra t es

Unilat rat

Bi t al

N th mandibula f t

O ther m dib la f t

Tw th m dibul f ctures

Common ted m dib la f t

T eatd by int emaxillary fixat

W th pe ed t w th t local fixat

W th int enal n g fix tu

W th k l tal fix t

W th m enal wiri d k l tal fix tu

Co dyl ct my

Osteo rthotomy

A d tal d d pt of th m thod f t rnal w g fixat f r h ca e l d d tog th t w th 4 ca r p r t

EYE

D wning A H Ocula Def ct in 60 000 Selectees A h Ophth Ch 945 33 37

D wni g d cuss s the cula d f cts n 60 000 el ct es who w e m ed fo i duct on i to the m d f c s He po ts th t f o me pre e ted some cul d fect.

The i cnd nc of c lar def cts was a f l l w s

	T tal no.	Ra 10
R fract e Err rs		
Myopi bel w / oo to 20/400	5 5	4
My p below /400	36	66
My p (h gh) nil ter l	48	5
Hypern t p bel w / oo to /400	7	845
Hypern tropia bel w /400	6	3
	3	3
Strabismus		
Esot p th ambly pia	77	78
Esot pia th t mbly p	8	706
E t pia th mbly p	96	
Ex tr pia w th t mbly p	93	646
Right hypertrop		
	45	48

Paralysis of the extraocular muscles was found in 24 cases (a ratio of 1:2,500) ocular nystagmus in 8 cases (a ratio of 1:750) cternal oculobornormities in 94 cases (a ratio of 1:203) bnormalties of the iris in 41 cases (a ratio of 1:46) and the felle in 257 cases (a ratio of 1:333) The we e 173 e taracts and 6 cas s faphacia the w s dise se of the eous 17 cas s (a ratio f 1:355) and of the ptic nerve in 53 cases (a r t o f 1:32) 45 of which prese t d at phy of this nerv D s e of the retina and ebo d v as found n 374 ases a males in 160 cases general ed s a s of the ret a dchor d in 6 cases abnormal ties of the eal reg on 197 ca s retinal deta hment and elosely all ed cond ti n 38 case nd typical myop echori reti t s 9 cases M ocular l s s of vis nd to ambly pia w s bserved in 2932 eases (visual acuty b low /A/) it was d to trauma in 836 cas s and it w s ontr umatic 96 Of the 293 ca s of m ocular blindness or with partial loss of v u acuity (49 p e of th e t r s r e s) 94 per ce t l d h v been pr ve t d 836 (28 per c nt) were post tra matic cases of monocular blind ness Amblyop i as f in 920 ca s 855 eases without strabismus 770 cas s with co gent strabismus and 95 cas w th divergent str bismus

JO UA ZUCKERMAN MD

Sn 11 A C J P r f rating Oc l Injuries 1m J
Opak 945 8 61

In n aly s f 72 c s s f perf t g cular
nj es which co ld be f ll d ove p od of
t me the author f d the foll w g fact rs and
compl cati s to be f mporta ce th g f th
pat nt the agent cau g th i y th l gtha d
l cat of th laceratio th nat d d g of
pr lapse th d gr e f dam g to th l th d
gree f ntra cul r h m rth ge th ccu nec f
le to th p es ce or hs ce f t ed tra
ocula for ign bod s a d the ccu f sym
path t c phthalm a

F c t r l d g t o u f v ble p ognos s in
l de in r es by hl t bjects d hl perfo at
f the globe ewe d g s e f r l ps sever tra
ocular h morrhage and a tra cular infect on

The incidence of sympathetic ophthalmia among these cases was 1.45 per cent.

Suggested surgical intervention included repair by means of conjunctival flaps or real sutures on both.

HUTTENBACH ROMAINÉ M.D.

Read M B and Full w L T Visual Disturbance Produced by Bilateral Lesions of the Occipital Lobes with Central Scotomas *Arch Neurol Psychiatry* Chic. 1945 53 65

The case of a patient who sustained bilateral gunshot wounds involving the occipital lobes of the brain in a fairly symmetrical fashion is reported. This patient was completely blind for a time and subsequently regained in a gradual fashion a certain amount of peripheral vision. He had bilateral central scotomas which remained permanently. Careful observations of the patient's recovery of vision were made with reference to perception of light, movement, form and color as well as other subjective visual phenomena and orientation of the field of vision.

The first visual function to return (two days after surgery) was that of light perception, and with this was associated dislike for bright light and it was later observed that the patient could see better in a dark room than with adequate illumination. Because of this loss of central vision the patient was day blind. In this condition the peripheral portion of the retina responds better to low illumination than to bright light.

Perception of movement followed very rapidly this onset of the better functions of the peripheral portion of the retina.

Perception of form is based on v s laeuty e pe
nene and i terp t t on eons q tly witho t
ce tr l v sio this patient had v ryl ttle pe ception
of stationary obj cts H was able t i terpret
ome e tent movi g obj cts in the pe ipheral field
part ularly f m l objects and e p i nce a d
memo v w red stinct a d

cept o color was slow but after five mo ths he was abl to cogize rd gen and blue neon s gns—appar ntly th result f an island of color vision in the rght homonym s s peior a da t

The patient continued to avoid bright lights or avoided looking directly at bright objects to do so produced a sensation of heat waves before his eyes with an increasing haziness which interfered with his vision.

The patient was not aware of the central scotoma despite repeated tests and discussion with him concerning the loss of central vision. He continued to insist that he was able to see objects directly before him and he stated that everything before him seemed of normal visual clarity. This is a normal mechanism of psychological filling in of visual fields and objects are thus perceived as a whole.

Seven months after injury the patient was able to appreciate the size and shape of objects with a patient

f the esid lild f is n a n w cente of d
t nctn ss a n w f t n l fo eaw f r m d d
h o l g p ject d h ubjct m d p i t
t the bli d macula r a At th s t m hec l d b
co r ced that h was g h i p h l i as
a s l t f g i z a t i n of h p y c h o l g c a l f i e l d
n d the l i q i h i g o f h o l d p t t e n f

HOWARD A. BOWEN, MD

All nd F P Diffu N ur fibromat (n
R c k l n g h u n s d s) In l m n g th Bul
ba Conjun t va R po t fa Ca with Le i n
f th Sk l t al System and Skin Bodily Asym
m try and Intracran i l n v l m n t A h
Ophth Chi 945 33

All nd po ts a cas of diff n u o f h o m t s
(von R c k l n g h s n s d s) h ch involved the
bulbar conjunctiva and was as ocated w th les o s
of th skeletal system and f the sk n and with
asymm try f th b dy as well as intra an l
nvolvem nt

There are the clinical form f n o f h o m t
() th se in which the p edomin t volv ment
i s t d n the central n rous yst m o n th
ntrac lo s () th se n which th t r n l
structures s th kin a affected and (3) thos
n which lesions of th kel tal system predom t

Th ca e epo ted r l d th f l l w g u n s u l
fe tu es tw nsh p coe t n i n e r fibr m tosis
and epil p y m y m e t r y of th b dy trac n l
l d r d e r s s l g h t m n t a l r t d t n skeletal les ons
utane u l s o (c a f e a u l t p m n t a t) and
p t l a l p e c i a of th scalp on the m d e a s th
affect d y e

Histol cal e m n a t n of th m ved t
c n s m d the d o i n e h b m a t s (n
R c k l n h u) JOSHUA Z. KERNAN, MD

Ry c r f t B W P n l l n n d the Cont l of D p
Int ul Infecti n B t J Ophth 945 9
57

The th r d s s p l n d th cont l f
d p t cul n f c t which r l t f o m p
t a t g w u d c a s d b y m n machu gun bul
l t s m t a r s g r d d h l l f e

He c m m d th f l l o w i n g m th d f th
c n t r l f th se n f c t n i n w t m

Th wear i f th P r s p x A t m n v
(m de of a c f t u t m t l) by pp n d
ult t r o p who l k l y t e t r s h
m i n e

Cle of the y w d a t f r d f i l d
t a t o s b y g r a l g n

3 Th pr c f p h t l m ge f
f r w a r d n h l d a s p b l th t t h n t r v l
b t w j r v d t m e n t d d th t t r
ocula f g n b d e e t r a c t d a d th t p
t r a t i n g w u n d a l e d

4 In f l a t n f p l l n p o w d n t l l w d
f the y t n r l y tag f th i n f t n
5 Spe dy vacuatio f th pat n t s h y t
b e h p t a l

6 The us f s u l f m u d e s a d f o r o n p r o t n
7 S a m h s e c t f o t h e s w h i c h r e q u i r e
t h s p e d e

Th a u t h o r p o t o u t t h a t p e n c i l l d o e s t
e n t t h m e d i a f t h y e w h i t i s d m t r e d
h y t r a m u s c l j u t i o n a d t h e f e t h e r e
f d e e p i f e t n f t h e y e s o t f e c t d T h e
t o l e r a n c e a n d t a l g e c t t i o s f p e n c i l
f n a p j e c t d t t h e m e d i a b t d p n f e c t o f t
e y e a n o t c o n t o l l e d t h e r b y P n a c l l n s u s d f r
p v t n r a t h r t h n c u I t h l d b e u s d a
l c a l p p l c a t i o n s s n a s p b l f t i j u r y

JOSHUA Z. KERNAN, MD

EAR

D n d y W E M n s D i a I n D e f M t
A h S g 945 5 74

A c o t l y d f m u t w t h s h a l o w
n b o t h d e v l o p d r e c r r g t t a k s f o t r y
t i o n n d o m t t h a g i t w t
t w o y r s A t t a k s w r p d d b y n o e s a l
a c c m p d b y f i l l t h g h t
V e s t b u l f t w n t c d d T a l s t
f t h e r h t h t h n w d e A m a l i r m u
f t h e b o o f t h p y m d a d f t h t e r m l a c o
t e m t u l n w t h a b o r m l y m l l c t u e
n e r v e a s o d t p a t

F l o w g p t n a c o m p l t l o f h n
w a s d m t r a d n t h e h t e a r d t t c k
v e t o w e b s e t u l t h t m e o f w n t g

N o p s r p o t n m e r d s a c s e
f o g t a l d f m t m h a s h f u d D f s
f t h t y p e h f r m l y b n h t b e s t i
w t h m t f r m t f t h l b y t h a d f t h
o g f c t T h e n d f m l e r d m
h a c a p s t s l d c
J R L D S Y M D

R n w H C t i d B o d y T m f t h M i d
d f E a d M c i d A h O t l C h 945
4 64

A h r r a t t m s o f t h c a o t d b d y e v r a
O h t m h h o c d n t h m d d l
d m t d b t w a s n o t d m o t r a b l t h z k

i b e e p t d f t h f i s t t m e

Th p t n w t h t y y r o l d h t m
w h h d b e n d a f f t y r s b t h a l s p
p t o t t m d R a d c a l m s t d t m y s
p e r f m d a d t h t m r m w m d R
c e r y w a s v e t f l J F D M D

NOSE AND SINUSES

K u l l y B M T h U n d A b f n I v s o c o n
t r i t M d t i n J A m M A 945 1
3 7

A a l i t f t h d f l s o
t r i t r m d e t i s d c a t d
Th p r i m y a s s t r i t f f c t o f s y m p a
t h m m t c d r u g l l y f l l w d b y e c f o
s o d d i a t t

duce n enla ged thy r d gland in the f t s It i
sugges d that th al b pl d hy d ine ome
eks b f e d l ery Fo p tie ts p e v i u l y
t e a t e d w i t h i o d n e f a l e d t o e p o d t o t h o u r a i l f r
e v a l w k s a f t r t r a t m t w a s s t a r t d Th
t l d s h a s u l l y b e n 600 m g m d i l y w i t h t h e
m a i n t e n n e e d g e r y a g n t h e e g e f o m o o
t o 400 m g m I t w o l d e e m t h t t h e t o i c e f f e c t s f
t h d r u g a r d t r d s a g

B V J M I N G O L D M A N M D

B p c h n e M r t n n K n d U h r b r a n d H R
x a m n a t i o n f P t n t s w i t h E p h t h l m i
G t T r e a t e d C o n r v t l y l e t m d
n d 944 7 5 3

W t h t h p i o d f m 93 t 94 9 p a t i e n t s
w r t r e d f o p h t h l m g t n t h K m
m H s p t a l C o p e h g e E g h t y f r w
t e a t d n r v t l y a n d o f t h e 4 d d f t
c u r r e n t d i a s h l n t h h o p t l d s d d
f e r t h e i d i c h g f m t h s t t o Th
m g 75 p t e n t r a m e d t h e m
m e f 943

A l l f t h p a t i e n t s e t t d t h s e d t v e s d
h d c o f i m t a d s o m e e c i d d s l s o

T h t y t f t h p a t i t a t d t h a t t h e y w e
h l t o k l t h g h l y 8 o f t h e s w e n t l y
y m p t m f e t h e t h r s p r e s e t d y m p t m s w h i c h
w e r m r l e p o d F i p t t s w e e
p a r t l y d a b l d d s w t o t l y d h l e d 7
h d u d e g p a t e t a t m t n t h t e r v n
i g p e d b c a u o f p e r s t n t y m p t m s a n d 6
h d d d f o m e p h t h a l m c g t r

D a t a n t h e b a s a l m t b o l c r a t e a t t h t i m e o f t h e
r e m i n a t i o n a t t h e t i m e o f o p e r a t i o n i n t h
t r e n g p e d w l a b l n t h c a s e s f 5
f t h e 69 p a t i e n t s w h o r v d T h e w a s a v
q e s t o a b l n a s e i t h e m t a b l i c a t (1 1 0
p e r c t) i 3 p t e t s R t s f e 4 p e r c t
w r f d i n 9

A m p s n o n o f t h e s r e s l t s i t h t h o s e o f p e r
t v t t m e n t h o s d s p t a b l y t h e d a n t a g
f g i c a l t e m e n t

M e d c a l t r e t m t w a s b e s t f r t h g p o f p a
t e t s i w h m t h l l e s s h a d b n p r e s t f l e s s
t h n o y a r a d w h s b a s a l m t a b l i c r a t
m a d h l 4 p r c t

U p o n e a m a t o f 5 p t i e t s w h o h a d
r e d y t a t m t t h e a u t h o r s o b s r v d
d f i t d f f r b t w t h e t h e p t r e s u l t s
h t d t h s g r p a d t h e e s l t s b t a n d m
p t t s w h h a d r e d p c l y m e d c a l t r e t m t

T h t h r s m p h a s e t h e f c t t h a t w t h m d c a l
t h e p y t h e s i s a m u c h l o g p d o f a l l e s s a d
d h i l t y t h a n w t h g e l t a t m e t a d t h t
t h i p l g a t o f t h e l l s f r t h e c r e a s e s t h
p o s i b i l i t y f t h e d e c l p m t f c o m p l e t n e
p e c l l y t h h e t

T h t h r s g w t h M e a d R c h d
t h t p r l y m d c l t t m e t f e p h t h a l m
g o n t e n e s s t e s t h p d i t o f m y m t h
o n c o m p l e t d c t c u r e w h e a y m p
t o m a t r e c o v r y i s p s b l n a f w w k s a d t h
h g h d e g r e f s a f e t y b y m e f b t t a l t h
d t o m y i n a i d m s i o

J F R K N A R A M D

SURGERY OF THE NERVOUS SYSTEM

PERIPHERAL NERVES

Ibáñez J S Study f th My nural Syn psia E
perimentally nd in Biopsi s f ll man Mus
cles In Cases f Paralysis (Est d d la psia
mu ral xp nm talm t y b p s de m s
cul h m p raltu) C g ap f co
m lor 944 93

In studies of ant i polio myelit m ce were in
oculat d with the Sh tra n of polio my litics virus
adapt d mice by Jung blut In ome cases it a
f u d that there wer no lesions of the se tor of the
med lla correspond g the paraly d muscles
There were marked ch ges in the mot pl q es f
the p lyzed muscles The hist l gical findi gs are
illust ated They showed dis tegrat on of th motor
arbo rizations of the plaques There w r n cha ges
; the sensory t minals

I the study of th egenerati n of the fibers
gu pigs were u ed a they d not uccumb to the
d s ase R g e rat n f the fibers w l u d

These studies sh that p raly s f ce t l
orig n due to destruct on f the n e cell of the
ant i r cod of th med lla s ; ep rable but
paraly s of pe iph l or g n due t chang s in the
erv a borizations f th motor pl ques s repar
able It was al f d that th e e f rms of th
d ease with both f ve a d par ly s f m s w th
few but without p rly s nd forms with ther
f r par ly s that i f m s in wh h th d s ase
is ot apparent but the i d i d aff t d act as
ear riers Th e plains the appea ce f th d eas
in al t d ca s th h a e p p a ntly n t b e
in contact with the viru This is of great mpo ta ce
; th study of the d ease

In m nng the the organs of th h dy th y
w e fo nd to sh w typ cal ch ng s wh chl ads th
uth t b lies that th d seas i a v rem a that
s that the v us invades the blood and s carr d t
th d ffer f o g s

Nerves f o m cases of h ma paraly s we e l o
tud ed and illustrat o of th h u tol g cal f dngs
ar g en S m l r ch ges were found n th rve
a b r izati s wh ch the author believ xpla s
the r c ery of fu ct n in the cases in which th
d as shows a favo able c urs

A Y R G M A V M D

BRAIN AND ITS COVERINGS CRANIAL NERVES

Den y Bro n D Di bility A l l g f m Cl ed
H d l l j ry J Am M o 4 945 7 4 9

A study s m de f o o cas of c l n head
i jury d a a ly s f o m v r n u ta dp ts is
given

Two hundred cases w e s l cted t of 43 con
secutive adm ss ons xclud g pat ts und r f fte

years of age and over fifty five as well as vagrants
and chronic alcoholic add cts The major ty were
derived from traffic accidents nd relatively few
we e severe consisti g chiefly of clo ed head in
jury with varyi deg ees of scalp wounds a d
vary g lengths of unconsciousness

An analysis of the symptoms d ring conval scence
revealed that 55 per cent had some symptomato logy
Th symptoms included h adache and dizziness as
well as psych atric symptoms The d sablity last d
fmm two to n n e mo ths (o mo c) f llow g injury
Th ty patients were p evented f m returni g to
their occupatio s because of i j r s ther than th
head j ry Of the r ma n ng 170 pat nts 136 had
retu ed to full cc pat ion w th two m nth s—only
5 being away f m work f r lo ger than ne month
Psych at c sympt ms appe red t have th h ghest
corr lat n ith p olonged d ab lty

P olonged d ab lty app ared t h ve some rel
to hip to lo g per ds of d sor ntati n abnormal
neur log cal gns blood in the spinal fl d and elec
troenceph lograph c abn malit es n add t on to
occupat onal w ies such as an i ty over eompe
sat or l g at on

The sympt ms as ocated with pr lo ged d sabl
ity w th the i j ry was mld o seve e cre
p ed m antly m t l sympt ms r l d to nx ety
I f w A B own M D

Schw tz H G and Roullac G E Cranioce
brat Wa W und Ob ry tl n on Delay d
Tre time t t S g 945 9

Th portu b s d n 13 ca i fracture f the
sk ll of huch 74 were battle cas lites and th
r m n der we e cide t l i n g es The number f
open h ad s ds was small but they ill strated
the p oblems th t must be fac d The are 21 case
hist s whch s rve to support the conclusi s f
th a thors Th r port com from the North
African th r f o peratio s

The early treatm nt cons ted of complete d fbr de
m t a d clous i l yers without drai age and
w th ut the local e f sulfonamid s but complet
pa of the dura by f scial aut genous t ansplants
w mad if t was necessary T nspla ts for the
d were obta ned usually from th tempo al fasc
h t om times fr m the fasc lta Compl te
deb deme t a d clous without drai age may b
sati factory ven after long del y In 8 cases
d b d me t was do after fr m thirty s hours to
I day w th clos e without drai g a d p i
mary h alng re ulted No arb t ary t me limit f
d fi e t eatment could be set a d furthermor
t w n t n ces ry As all m d cal sc ence ch
cas must h j dged on its m r t Apparently it
wa b tter to delay d fbrndem nt t a pl ce where
the was competent personnel and d quate eq p
m nt than to g ve ncomplete treatment i the ab

se ce f these f lites The n cessity for stand d qupm nt su h as sucti n sil er clips a d th electrocautery is emphasized

Cases we p esented in whi h d q t debrid ment h d b n carried out t v rying periods f time These h d to b subjected to rad cal d bride m nt and t was p ss ble in ma y instances t d this with t ght l s and with out drain S ral illust at ve cases d rib d in whi h this w s don at tim intervals varying f om ight to thirty two days following the first inadequate treatme t a d p rtial debrid ment f the w und T ht d s es not th treatm nt f hoc in ll cases f that a matt f surgical judom nt but t can b com pli hed in me cases

The sulfon m des were n t used l cally as a rul even in late cas but l ed ses f sulfa drugs w g ven by m uth nd p t lly t h ck the bl od concentrat on

F cial tra plants we e u d to cl dural de fects b tin some f the late cas s th yw n t c essful because of p and c sequ t slo hi D fficult with f sc l tra pl nts at p rtu lly l k ly t d v l p wh n t nadequate debrid ment Th p chn f op n head w u ds w th l f nam d as l n gau ew d d u s m t bl

W th gard to f n b d m tall c m t r l was n t o de d s c nstant o flect a d when n t access bl t was l ft n pl h t th d n t apply t the fo en h d s l d b fra m ts nd pecs of cloth and of h r we p rt cul ly l hl t p odue fect o less r m ved mplet ly

The t m nt f cerebral h m as was c nserv at a d sust d f c m pl t d h id m t w sh g with boric solut and dres with as lun ga lumb punt e o ll f the m th d

Th uth rs rt le should h f m t est t ll tho who l k ly t h v t deal with njures l this type I th thate of perat t pp red that train d person n la d d quat qupm nt we mo mportant th n cally perat esp lly f th t t n m d f ramp ffect d bride m t of th w nd Th d l t eatme t v ry cally d cal d bride m nt with all th fa ltu f fully train d pers n el d c m pl t euro gical qupm t

ADRIEN V UGHEEN M D

R w both m G F nd Ogilei A G Ch nic
Intra rebral H m t ma B t M J 94
46

The clinical p ctur fa p ntaneo bara hn d h m rrr g s u lly a ily ecogni d by dd ve h ad ch with with t l s of co sc s nes n a young m d d l d p v u ly h lthy and vid l Th d agn is th n v rifi d by th p ese ce of blood in th l mb b p l f d S ch hemorrhha es oc a a esult of co g nital euryms d et a w lness th in th mesoderm l vascular layer at the sit f jun tion of tw ves ls r from a stump r mn nt f primitive vess l whi h has not compl tely disappea ed

With u h most f these an urysms rupture mto the s b rachnoid spac som become adherent to th bral corte a d h nce may rupture intrac r b lly If the pat nt survi es the cute eposd chr nic ntra b al h m toma d el p T quite s m la ca p s nted as e mplies of th latt g up B th p t nts had a complete h pleura whi h d v lop d t the o set a d faled to mp p mod of few weeks th y contin d to ompl n of h dache and de el ped a econdary n ntracra l pressure as evide c d hy p plelema

Desp te evide ce su gestive of recurrent bleeding p ated lumbar punctures f lled to reveal a fresh suh r hn d hem rrrh ge On the basis that this wa n int a hral less n rris from th m l f reh l t rry ts bra ches th t n r rrg n of th yl n fi r was plo d by a myopl te c t m y

In both ca a cystic h m toma was fo d on the p o temp r l g a d the other in th le f o tal r F ll wng r m m of th hemat m n t em ly p d reco ry f m th h mplem ed a d b th pat t ha returned to a rm l life

Th th rsc l d that th h m pl a w s d t p u p th m d dle bral rrry rrrd th pon th rt p thw ys n th co ry w s rapd Th is nt ra lpre ur s pl ned by n c siz f the h m t m h l t d l man n f f f d d t th esed m t t s o f l w th breakd wn f th blood l t It was h l ed th t the gers f t mptu f t expo and l gat rrysm the d pth f t lv e n w t gre t t w rrrant s h ap r d bow v r th cc fev cu t n th r t sud bl O the th hand th author d bt th t u ry ha m ch t f n the t e treat f o din ry popl xy n fact in th e ly ta es of c h l hem rrrh d to yca s

J c k L Woo M D

Sweet L K. Durn ff St nley E D wll g H F
nd Lepper M H Th Treatm t f P mo-
cocci M ainglti with Penicillin J Am M A
945 7 63

P mo cci m ntis s pp e tly rryes t t l l f m f t e time t l dings l f m d th rapy Fifty caes f th d a ed ussed in this rt l som f whch we een d treat d privat p tce thers w e dm t t d th Gall Muncip l H pt l Washi gt D C betw n July 94 and A ou t 944 Upt De cemb r 1943 4 p t nts w tre t d w th r sulfadiazin r sulf m raz with the add t n f typ pecific nt pn m coccal rum in s cases Sin D cemb r 5 943 p cillin b cam a ble ds ce then 6 p t t shav b t t d l t the first gr p f p t ts wh m pe cilli w t us d th w 37 d ths wh as in th gro p f 6 p t tstr ted with p e call d th r forms of th rapy th we 9 deaths T hles how L

l ge and lo ge n t i e n t a t e r i e s c o u l d n o t b e c o n f i r m e d . O n t h e o t h e r h a n d i n a b o u t 50 p e r c e n t o f t h e u l n a r n r v e s x a m d t h r w a s a n c r a s i n t h e n u m b e r o f e l a p p l y i n g t h d i s t a l p o i n t s . T h i s w a s e h o w e v e i n t h e c a s e o f t h e m e d i a n n e r v e .

The t r v r u m a e g e n e r a l l y s h o r t f r o m / t o / i c h i n l t h . O c c a s i o n a l l y p a r t i c u l a r l y i n t h e s u p p l y o f t h e m e d i a n n r v i f m t h d l t y b a c h e s u p t o n c h n l g t h p e s e t . The v e s e l t a k t h m o t d i e c t c o r s e t o t h e n e r v e a n d a r e e l l y t a g h t o g e n t l y c u r v d a n d e n t e t h n o n t h e p n t g a s p c t . O c c a s i o n a l l y a r e c u r r e t t w i g f o m m c u l b h n t i s t h n r v e n t h a s p c t o p p o s i t e t t w h i h t h d t n u t r i e n t t e s w e e n t e r i n g . T h i s o c c u r s m o t f r q u e n t l y i n t h e s u p p l y o f t h e m e d i a n a n d i n n e r v e s i n t h e f a r m .

The b h v i r o f t h e t r y o r a c h g t h e n e r v e i d a g r m m t c a l l y r e p e s e n t d n f i g u r () t h e v e s l m a y p l u g t a v a r i e t y o f g l e s m m d a t e l y t h e v e s l () t m a y r u n d i t a l l y d t h n i c t h e r v e (3) t m a y r u n a l n g t h e r v g v i n g o f f p n t r a t i g v e s s l a n d t h n l a v (4) t h n r v m a y b e a p p l i e d f o r m a n t e l l p (5) t h n t n t a r t e y m a y d i d n o b f r a c h n g t h e

(6) o c c a s i o n a l l y n a r t y p r i t a v e l w t h w t h t s u p p l y g t h n e r v e (7) o c c a s i o n a l l y a v e s s e l t r t h e n r v a t t h e m l v l

T h n t n u r a l v c l a p t t n s c m p o d f 4 y t m s o f v s s e l p l l i w i t h t h l g t d i n a l o f t h n e r v . T h p u a l s t m c o m p d f a r t e r i o p c a p i l l s w i t h f e w t r a v e r s

b l q u e a s t o m s . T h t a s c l a r a t i s f m a n d l g t d i n l s y s t e m f m w h i h t n a r e d r i v e d l g t u d n l y d i s p o s d y t m s o f c a p i l l a r y n d p e c a p l l r y s e d v l s i n t h p n e u m d i n t h f a s c u l . N i g l e s e l d o m a t e d t h i t e l p a t t r m e t h e n t l e g t h o f t h n r v . M j r n t r a l c h n e l f o n e s g m n t a e g l y p l a c e d b y w l y e t

g t e l a s t h n e r v d e s c e n d . O c c a s i o n a l l y n b t h e c a s e o f t h u l n r a n d t h m e d i a n e r v e s a l g e s s l o n t h i n n r u r f a f t h n e r v e s h a b n o b r v e d t d e s c e n d f o m t h a u l t t h e l o w w i t h o u t t r u p t o r a l t e n o f p o s i t i o n . T h e s a g n r a l t n d e c y f r t h l a r g e s t i n t r a n r a l v e s l t b e p r a y e d t w a d t h c e n t r f t h n e r v n t h e f e r m a n d t w a d t h p e n p h r y i n t h e r m .

A c h a e t e c f e a t u r o f t h t r n u r a l v a s c u l p a t t r m s t h n i d a b l a p o f a p p l y b t w e n n t i n t n e s n t r i n g t d i f f t l e l . T h e f o t w u l d e m t h t n v e s l a n b d t s u p p l y a p e c u s e n d d i s c r t e e g m n t i n r v . D u r i n g t h i s t u d y n r v w e f e q n t l y s t r p p d t p r a t i n f a l l r o u n d i n g c o n n c t n f d t a c e s u p t r c m y t w h n t h n r v e w a s d v i d d s t a l l y t h c u t n d f i t h e f e d e g m t n t d t b l e d p o f l y . T h i s d m o n s t r t d t h r i c h e s s f t h e n t r a n e r a l a s t m o s e s .

V n u l e s w e t h e l g e s t v n u e s s l s n i n n e r v e s a n d l e a v i n g t h m . T h e i n t r a n e a l v e u

p t e r n c o r r e s p o n d e d n g e e l t o t h e a t e n a r g e m e t . L a r g v s i f t h e d e e p r v e s g e n e r a l l t e m a t e m s c u l v s h o v i t s n o t i c o m m n t s l g e m g i v e s t e r i g p r c p a l v s v e s o f c u t a n e o u s n e r v e s a l s o g e a d n t o m c u l e b e n e a t h t h d e e p f a c a l t h g h d n g e i n t o t h e b c u t a v s y t e m i o t u c o m m o

The p i n c i p a l b l o o d a p p l y t o t h e m e d i a n e r v i n t h e u p p e r a m c o m e s f o m t h e a x i l l a r y a d b a c h a l a r t e r i e s . I n t h e c u b i t l o s t h e n e r v e c e s t s u p p l y f o m o n e e l f t h a r t n e s l a t d t t n t h r e g i o n i t h f o r m t h e n s s u p p l d b y t h e r a d i a l d u l t e s d p n a c p l y b y t h m e d n t r y w h p e s t i t a s p e s t n 7 f 37 p e m e n s

T h u l r n r v e i a c c m p d t h o g h o t u s c o r s e b y a c t o t l h a i d e n e d t u n f o m t h a x i l l y r b h a l i n e l l r a l s p a t o c h l r p o s t e i o l r a d i a l a r t e . T h l t t e t w v e s s e l g v t h p c p l a d m o t s t a t a p p l y t o t h u l r n e r v e

The d i l r v e i p p l d b y t h a l l r y s u b s c a p l a h h a l a n d p u d b c h u t n e s t h a l l d a r m b f r t t r s t h p l g o o b y t h p f d a b c h u a t e r y w h e l t h e g r o o d b y t h a s t o m o s s b e t w t h p o f d a n d t h a t e r r d l c u r r e t a t e r y h l i t h t r a m c u l a f r r w b t w e t h e b h u l m d m d l l y a d t h b a c h i d a l d t h t e n s c a r p d i a l l o g u s m l l t a l l y . T h m a p p l y m o t c a s i b t a e d f r m t h p o f d t r y

T h s p i f i a l d i l e r v s p p l d b y t h t o r a d i l r e c u r r t a d a d i l a t e s o t h h a h e . T h e p o s t r i o t r o s u e r v e s u p p l i e d b y t h a t r a d i l r e c u r r e t a d p o s t n o s u t n e s d o c c a s i o n a l l y b y t h a t t a t o s t r y i t h e d t a l t h r d o f t h l o a r m

T h m e d i a n r v e s a l l y r e c e s m e n d l a r g e n t n t v e s e l t h p p a m t h i n t h f e r m . T h u l n r v c e s m o e s b u n t h e f o r m t h a n t h r m i n a m a j o r t y o f c a s e s . H o w e v e t h e e s d t h r m a l t h a n t h o n t h f o r m

HENRY A. SHENKIN M.D.

P a p p e n J . L . T h H r n i t d I n t r r t b r a i D i s c . A n A n a l y i f 400 v r i f i d C a s e s . N E g l a n d J M 945 3

The t h e p r e t s n a l y s f 400 e n l i e d c a s e s o f h e r n i a t d i t r v e t e b l d i s c s w h h w e r e s n v e r c r s e o f t e n y e a r s i n t h D e p a r t m e n t o f N e u r o l o g i c a l S g r y o f t h L a h y C l i n i c B o s t o n . T h r i s n o d c u s o n i m p a r a t v r e c o t m p o r a y p b t c e l l e n t a n l y u s i f t h 400 c a s e s i s g i v e n . T h e s e c a s e s p e s e n t n l y 8 p e r c e n t o f t h p a t i e n t s w h p e s e t t e d t h e m e l e s t t h C l i n i c i n t h l w b a c k a c s c i e t a o r b t h S c i a t c a w a s p r e s e n t i n i l f t h e s p a t i e n t s c p t d t h m o s t c o n s t a n t o p e r a t v e f i d g w a s p o s t e s t r a g h t l s

sign. The author believes that this sign would appear in 100 per cent of the cases with 1 intervertebral discs at the third, fourth and fifth lumbar segments provided they were amenable in the acute phase of the condition. In difficult cases oxygen spinograms were made. Oddly characteristic findings of a herniated disc were not noted in the roentgenogram.

It pointed out that conservative treatment should be attempted especially in the cases in which there has not been prolonged disability or prolonged pain whereas in cases in which the pain has caused serious disability and economic loss, operation should be undertaken. With regard to the questions of whether the disc should be removed and whether a fusion should be added it is believed that if the history of predominate low back pain associated with abnormal facets and an unstable back the patient should begin the benefit of a fusion. This is advisable particularly if the occupation of the patient consists of heavy manual labor. The thoracic factors so that totally the herniated loose part of the disc should be removed by total disc excision.

The relief of sciatica was satisfactory in most of the cases but in almost half there was residual back discomfort or heavy lifting or hesitation. This situation was not materially improved in the patients (9 per cent of the series) who also had loss of sensation if the patients did not obtain any relief of the pain.

Attention is called to the possibility of mistaking a fracture of the cauda equina and to the fact that 6 patients in this series had developed complete paraplegia as the result of mass extrusion of disc tissue.

ADRIEN VERBRUGHEEN, M.D.

K. J. A. The Conservative and Operative Treatment of the Intervertebral Discs in the Low Back Series 1945, 7, 9.

This interesting article by a orthopedic surgeon presents an exhaustive study of the cause and treatment of patients with low back pain. It is based

upon a series of 100 consecutive cases which were operated upon for ruptured intervertebral discs in the lumbar region as well as many other cases which were treated by conservative means. The history and physical examination were the prime factors considered in determining the type of treatment to be given the individual patient. It is emphasized that conservative management attempted first and only in patients having a history of prolonged disability and relief from conservative treatment should operation be considered. Roentgenograms of the lumbosacral region were taken as confirmatory evidence of a disc lesion and it was noted that frequently even though a narrowed space was seen on the roentgenogram the disc lesion was not necessarily at this space but might be in a space which appeared normal in the roentgenogram. Spinograms were not taken. As a rule at least two disc spaces were explored.

For the purpose of treatment patients were classified as ambulatory patients, bed patients and operative patients. The group of ambulatory patients were treated with supports with or without sacroiliac pads especially supported beds were advised and in some cases manipulations were employed. Bed patients were treated by placing them with the head and knees flexed and the application of local heat and when the acute symptoms had subsided the ambulatory treatment was continued. With regard to operative treatment this was suggested only when conservative methods had failed. The protruded part of the disc as removed without curettement of the nucleus pulposus and with or without spinal fusion. The operative technique is very carefully described. This is the treatment by spinal fusion which is done according to the operative technique described by Breek and by Basom and Bosworth. Also it is pointed out that the surgical treatment does not give a 100 per cent perfect result but this remark is true in other surgical conditions. The results of this series of cases are highly satisfactory.

ADRIEN VERBRUGHEEN, M.D.

SURGERY OF THE THORAX

CHEST WALL AND BREAST

N h m n B A R ult of T atment of C n r
f th B a t t Centrallasa t t in Bo s
Sw d n Act adiol Stockh 943 4 478

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AUDRE G MO A. M.D

TRACHEA LUNGS AND PLEURA

Ma H C. nd Klopstock R. Lobect my f r
Pulm nary Tube cul l J Thorax S 945

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l t r a l l u g

6 U n i b a r d i y u g p r s e s p e a l l
i t h g r o i g c h i d (L o b e c t m y w a d e p r e f
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th racoplasty. Another patient has tuberculous empyema and all quiescent racoplasty. The fatality occurred as a result of contralateral spread in a patient with large amount of sputum.

Among the 151 patients the sputum was negative. Of the 12 negative cases 6 are negative by culture methods and 6 by concentration methods. The little being to report to obtain negative cultures. The general condition of the patients is good and some are working.

The authors have not attempted to draw any final conclusions regarding the resection of lung tissue for pulmonary tuberculosis and they have presented their results merely in the hope of clarifying the meaning of the problem.

FRANK D. D. RILEY, M.D.

J. N. S. R. M. T. T. and Partial Pneumectomy in the Treatment of Pulmonary Tuberculosis
J. Th. S. 945, 43

The author reports his experience with resection of the lung for pulmonary tuberculosis. Since October 1914, 17 partial pneumonectomies and 15 total pneumonectomies have been done. This report is up to May 1914. The cases are broken down into groups of upper and middle lobe resections, lower lobe resections, and total pneumonectomies.

Upper and middle lobe resections. In this group there were 7 upper and middle lobe resections. The surgical condition in 6 of the 7 upper lobe resections was a persistent cavity in spite of selective pneumothorax. The other upper lobe resection was a fibrous cavity with the cavity at the apex. The middle lobe resection was done for a bronchitis. In the group there were 5 deaths which occurred about 1 to 2 months later at a distance of 1 to 12 months after the operation. Of the 12 middle lobe resections all clinically ill and 1 died. In the 12 middle lobe resections 11 had positive sputum findings at the first bronchial stop.

Lower lobe resections. In this group there were 2 cases of tuberculous bronchiectasis. In the 1st case died 1 day after the operation of upper lobe resection. In the 2nd case the patient survived for 1 year after the operation. In the 3rd case the patient died 1 year after the operation. In the 4th case the patient died 1 year after the operation. In the 5th case the patient died 1 year after the operation.

It is concluded that the patients in the last case of lower lobe resection with the following findings: 1. In the 1st case the patient died 1 year after the operation. 2. In the 2nd case the patient died 1 year after the operation. 3. In the 3rd case the patient died 1 year after the operation. 4. In the 4th case the patient died 1 year after the operation. 5. In the 5th case the patient died 1 year after the operation.

Partial pneumonectomy. There were 5 cases in the group. In the 1st case the patient died 1 year after the operation. In the 2nd case the patient died 1 year after the operation. In the 3rd case the patient died 1 year after the operation. In the 4th case the patient died 1 year after the operation. In the 5th case the patient died 1 year after the operation.

of the fore and middle lobes another a cavity in the middle lobe with extensive disease in the lower and upper lobes. The remaining case revealed a tuberculous area near the hilum with collapse and bronchiectasis distal to it. In this group only 1 patient died in the immediate postoperative period. The death was due to a questionable embolus in the remaining lung. One death occurred about two years after the operation because of extension of the disease in the other lung. Another death occurred about five months postoperatively because of contralateral disease. One other patient is in poor condition and expected to die. Two of the surviving patients have positive sputum and it is due apparently to ulceration of the bronchial stump and in the other to bronchial disease in the other lung. One other patient is in good condition but has a persistent empyema. Another has non-tuberculous bronchiectasis on the other side but is free of tuberculosis. There are 11 in this group of 15 pneumonectomies 7 patients have had an excellent result and several are doing part time work.

In this whole group of resections the individual ligament technique was used in all but one case. This was an early case done with the technique. Emphysema developed but the patient survived.

FOREMAN, D. D. RILEY, M.D.

McCroney, J. S. Postoperative Pulmonary Embolism
B. Ill. M. S. 945, 79

Pulmonary embolism is always a complication of surgical procedure and is almost always confined to the person to be operated on. When the embolism takes place the symptoms usually come on suddenly. The death occurs quickly in accordance with the size of the embolus. Some emboli are somewhat hours or days. Not infrequently the patient recovers completely. In brief the symptoms are dyspnea, substernal pain, orthopnea, cyanosis, and anxiety.

Because pulmonary embolism can take place there must be thrombosis of a vein in some part of the body. The common places for sites for thromboses are the veins of the lower extremities, the pelvis, and the upper extremities. Small non-fatal emboli are frequently common. The right side of the heart usually forms the most common site. Embolism usually occurs in the deep veins of the lower extremities. The embolism may be the only indication that some thrombosis is going on. Many emboli usually come from the lower extremities, although they may begin in the lungs. The thrombus may have been far down the leg. It is rarely the case that an embolus has its origin in the upper extremities.

The treatment of pulmonary embolism is with the normal flow of the blood goes far beyond the normal flow and clots form. There has been no blood injury to the vessel. Many factors apparently participate in the formation of the embolus. The factors are divided into three groups: (1) stasis of the blood, (2) injury to the vessel wall, and (3) changes in the composition of the blood.

Th tho d ta h s d on 577 aut ps es
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HEART AND PERICARDIUM

V n B hem F S P Sh rp P n trating H t
W und Acta med nd 943 4 496

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ca e p d ly p d flammat
A RE G Mo v M D

ESOPHAGUS AND MEDIASTINUM

Sw t R H Tra th ci Resecti f th
Es ph gu and St m h f Ca ci ma f
S E 945 7

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t (Fig)

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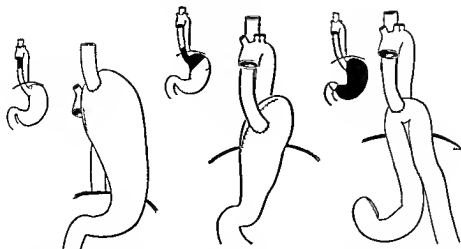


Fig 1

Fig 2

Fig 3

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d g n e c v e y was 31 43 per cent The total
mbe f e c es w th t c m p l i c a t i o n was 41
r 67 p c nt

Lmpyema as observ d 8 c s It w a co
t i b t g ca u e o d th n s f the pat nts b had
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b f r e th j e r r o q a t a t i m h l f n l m i d e
wa b i g used locally i th chest a d h e l o r e
cath t d i n g e f th l f t p l e u r a c t y as u d
ro t i e l y l l c a s e s S i e t h n t h e h e h e n n
e s f m p y e m a e c p t i n t h t t a l g a s t r e c t o m y
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l u d t a t p y s p a t i e n t w h o d d f v e
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A P r e l i m t y p e p a t n o f the p a t i e n t
r P r o l g d p p e t i e h o s p i t a l i z a t i o n f the
p a t i e t (f r m o t t h e e w e k) t o p o v d e f
p h y s c a l r e s t a n d t h r o u g h c l i n i c a l a d l a b o r a t o y
t d y t o e v a l u a t e the p a t n t s c o d t o n

T n s f u s i o n o f w h l e b l o d s u f f i c i e n t r e s t e
a n r m a l l e l o h e m o g l b n a l t e p h t h e m g l o b
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3 A d m i n t r i t i n f a h i g h p r t i n h i g h c a r b o
h y d t e d e t. T h i s m u s t o f t e n b e a l m o s t e t i e l y

liquor in the obstructed cases of those patients who
 take small doses of well-blended pepsin
 4 Administered in large doses fascioid
 (from 100 to 1000 mgm) per day

5 Administered in form of B complex
 liquid form

6 Digitalization in the patients with cardiac
 fibrillation and in certain elderly patients

7 Rupture of stomach in a female aged 42 years
 caused by four hours of forty-eight hours of pressure
 the day of operation

8 Preliminary jejunal feeding, a five
 patients who cannot swallow adequate liquid or
 semisolid diet

B Conduction of the operation
 1 The use of a tracheal position of the
 halothane anesthesia (ethyleneglycol)

2 Routine complete penicillin of the lung by the
 anesthetic ether is entirely satisfactory in the
 the progress of the operation

3 Transfusion of blood during the operation
 This is the standard of blood transfusion in the
 a drainage to a point of blood drainage
 ing the course of the procedure

4 Ureteral catheter throughout the
 anastomosis

5 Adenectomy of the masses of the
 6 Scrupulous hemostasis a particular
 avoid the development of hematoma; the
 tery of the vessels

7 Avoidance of trauma to the nerves
 the esophagus and clamp for the anastomosis

utilization of the ether

8 A decrease of splenotomy when possible
 prevent the development of thrombosis of the
 vein and subsequent hepatic emboli The
 must be noted (a) if (b) if adhesion of the
 growth of the growth of the tissues
 the pleural and (c) if the iliac in the
 the aorta (especially those cases in which
 the splenic jejunostomy performed)

9 A decrease of the local anesthesia
 method which would predispose to the development
 of emphysema

10 Rupture of the trachea during the
 drainage of the chest

11 Ligation of the blood vessels just above the
 the growth of the anastomosis

C Postoperative care
 1 Rotation of the patient to the left
 hours of the patient's lying

Removal of the left lobe of the diaphragm
 after the operation

3 Removal of the chest drainage from the
 the patient's chest

4 Cuff of the chest (tension) of the
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5 Aspiration of the chest fluids under the
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7 Digitalization in the patients with cardiac
 fibrillation and in certain elderly patients

8 Preliminary jejunal feeding, a five
 patients who cannot swallow adequate liquid or
 semisolid diet

9 Administered in large doses fascioid
 (from 100 to 1000 mgm) per day

10 Rupture of the trachea during the
 drainage of the chest

11 Ligation of the blood vessels just above the
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C Postoperative care
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MISCELLANEOUS

11 Rupture of the chest (tension) of the
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that such persons who may have suffered recent illness are likely to consult their physician before undertaking air travel.

It is the opinion of the authors that this represents a case of spontaneous pneumothorax in which the precipitating factor was the change of atmospheric pressure produced by the ascent to 8,000 feet in a airplane may influence the advice given to patients in this respect.

In considering the mechanism of this accident, it is probably easier to consider first the precipitating factor which is known rather than the predisposing factor which is questionable. Under normal conditions the pleural cavity is merely a potential space between the parietal and pulmonary pleura in which an average pressure of about 756 mm. of mercury is maintained. In this case the pressure was rather abruptly dropped to about 56 mm. of mercury or by about 6 percent which caused the lung to col-

lapse partially. As long as the pleural cavity remains potential this would not have been possible but with the development of the tendency of the pulmonary pleura to separate from the parietal pleura weakness in the pleura was exploited and pneumothorax occurred.

As far as the predisposing factors are concerned evidence seems to point to adhesions or emphysematous blebs rather than to tuberculous infection in a large percentage of cases.

It has lately been reported that patients with traumatic pneumothorax may be traumatized by air at low altitudes without injury.

Although no definite conclusion may be drawn from this particular case it is the considered opinion of the authors that extreme caution should be exercised in advising patients who have had known old cases of the pleura about airplane travel.

J. N. K. KATZ, C. M. D.

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

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B JAMES GOLD M.D

GASTROINTESTINAL TRACT

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Curv A t m d nd 94 S pp 6 p l t

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On the basis of the works referred to and the author's investigations the limit for the normal maximum rise was fixed at 0.210 per cent and the duration of the hyperglycemia at one hundred and twenty minutes. The exception cases at one hundred and fifty minutes.

The group of patients with nonoperated gastric duodenal ulcer likewise comprised 50 individuals. In 18 from eighteen to seventy years the greatest majority under fifty years. Altogether 52 patients tolerated the tests well.

In the fasting blood sugar was respectively 0.117 per cent while in the remaining 50 patients between 0.074 and 0.110 per cent. Thus the accordance with the value for normal individuals.

The great majority of patients showed a normal blood sugar curve whether the examination was made during a period of peace or not. In 6 patients with pathological curves other causative factors detected in addition to the ulcer which was therefore regarded as the cause of the disturbance. In 5 other patients with pathological curves the possibility of the contributory factors were pointed out and concluded with certainty.

18 of the 50 patients the blood sugar the hyperglycemic phase fell to 0.65 per cent. In 5 patients the 8th had symptoms of hypoglycemia during the test. One of these was purposely selected for examination because he spoke of having had symptoms that might suggest attacks of alimentary hypoglycemia. In the remaining 49 cases the amnesia continued in this that seemed to point to the disturbance. These patients estimated the amount of food consumed in the observations of all authors that interpret the frequency of the hypoglycemic attacks as a sharp fall of the blood sugar the hyperglycemic phase.

The group of gastric resection cases comprised 38 individuals aged from twenty to seventy-three years. In 15 the cases of chronic diabetes mellitus were present the blood sugar curve had a typical diabetic appearance. This patient notwithstanding the following general remarks.

In 17 the remaining 37 individuals with pathological hyperglycemia as observed in all the 32 of 70 tests. 12 of the 37 cases of glucose tolerance tests or carried out at intervals of 10 to 20 years. Of the patients examined in the hospital in 1932 the observation because of the reason that the cases of diabetes were not examined. The pathological hyperglycemia was observed after the ingestion of glucose. Thus shows that the pathological blood sugar curve is of the stromal type. The persistence of the pathological condition may be seen in the serial tests have been made in these individuals. The hyperglycemia most often found to be of the pathological type or is rarely normal but the reason is not stated. Otherwise we may find a variation in the blood sugar the same individual at different examinations. This applies to both persons

with normal and those with pathological hyperglycemia but the variations are regularly found to be greatest in the latter group. On the other hand we may also find several curves of practically identical form in the same individual.

In several cases the blood sugar after the ingestion of glucose rises up to 300 per cent more. The maximum value is reached at different times mostly after 30 to 45 minutes but generally later than in the normal subject. Meanwhile the absolute rise per minute is greater in the gastric resection cases because the maximum value lies higher. In spite of the high rise the duration of the hyperglycemia is small when complicating factors are present.

A great fall of blood sugar in the hypoglycemic phase occurs more frequently after gastroenterotomy than among normal individuals. In 4 patients with ulcer. The frequency in the latter groups has been mentioned. Of 37 persons with gastroenterotomy 7—or nearly half of the number examined—showed a fall to 0.65 per cent or much lower (7 of 70 tests). Likewise this speaks to the individual does not always react in the same manner during different tests.

From what has been stated before it is seen that the blood sugar curve shows two main characteristics namely a gradual rapid primary rise and a subsequent rapid fall to low values. The curve is therefore of the type which MacLean designates the lag type. On the other hand it must also be emphasized that it is often found a normal curve.

Glycosuria was noted in 19 of 37 individuals in one or more tests. Two of the subjects were seen for examination on suspicion of diabetes because the physician had detected sugar in the urine. A third was already mentioned in the hospital in 1933 for observation and the diagnosis glycosuria.

Eleven of 37 persons presented symptoms of hypoglycemia during the more tests (in 5 together). In none of these cases a resumption was observed when the blood sugar value was over 0.63 per cent.

The group of cases of resected stomach comprised 95 persons. 53 of the 95 patients were of the type of 8 or more men and 4 women. In this group 13 glucose tolerance tests were made. The variations in the amount of the eight years after the operation.

The fasting blood sugar in normal individuals of the total number of tests it lies between 0.77 and 0.10 per cent. The high value (0.15 per cent) being found only in one case.

The maximum value varied between 0.119 and 0.294 per cent. The pathological hyperglycemia was observed in 21 of the 95 cases in altogether 26 tests. The degree of the cases which complicating factors may with more or less probability be presumed to have been present in the examination of the 21 individuals (316 tests) in which the pathological rise must be ascribed to the operation on the stomach. In normal subjects maximum value above 0.180

the effect on the blood sugar said this influence of the predisposition will get the presence of factors which may occasionally give rise to a hypoglycemic attack.

Different opinions have been expressed as to where the effect of the action of the pathologic blood sugar curve after stomach operation is. The general rapid rise is assumed by most authors to be due to a rapid emptying of the stomach. The disagreement concerns especially the question as to why abnormally low values in the hypoglycemic phase in these cases are found more often than is usual. It is logical to seek for the cause in the stomach the functions of which are known to have been altered by the operation. The function of the pretestigton attention has been directed solely to the stomach. The author believes that the secretory changes may be left out of account. Interest has therefore been devoted principally to the motility of the stomach.

After gastrostomy and resection a change in the mechanism of gastric emptying is taken place. On x-ray examination this is generally found to manifest itself by a rapid emptying. A number of works are quoted which it is shown that the rate of finding in the respect do not always correspond to the man in which a dilated stomach is discharged from the stomach.

In order to indicate the possible relation between the emptying time and the glucose tolerance curve, a tonal aspiration of the stomach was carried out in several tests. At each determination of blood sugar some centimeters of the stomach contents were aspirated for a qualitative analysis for sugar. It is pointed out that this method is not always furnished a correct insight into the mechanism of emptying for it must be assumed that in many subjects with gastric resection or ectomized stomach the emptying will proceed too rapidly immediately after ingestion of the glucose. As the pressure in the stomach increases the passage will take place more slowly and the emptying time to prevent a danger of reaction even in these cases. This assumption agrees with the results of the radiographic observations. Therefore, it can not expect to find constant concordance between the course of the blood sugar curve and the emptying time.

A patient was undertaken in a healthy condition the tolerance tests. The stomach was found to be empty one hundred and thirty-five minutes after ingestion of glucose at the first determination. The sugar was present in the blood and the beginning of the emptying time after the first examination. No definite relation between the course of the blood sugar curve and the gastric emptying could be ascertained.

A patient with a perforated ulcer of the stomach with a peptic ulcer. The stomach was found empty one hundred and fifteen minutes after the beginning of the test. The earliest blood sugar determination times. Thus, about one third of the subjects suggested was found in the stomach contents that

the conclusion of the experiment. In 2 of the latter rays the emptying time was 100 minutes. In the case of pyloric stenosis, however, the stomach was found to be empty one hundred and thirty-five minutes after the ingestion of glucose.

Like use in the ulcer patients no certain relationship between the emptying time and the blood sugar curve could be noted. When the gastric emptying is retarded because of pyloric stenosis is the hyperglycemia must eventually be expected to last longer than is normal. In none of the tests in which the emptying proceeded slowly was there a great fall of the blood sugar in the hypoglycemic phase. On the other hand in cases in which the blood sugar fell to 0.06 a drop of 0.05 percent respectively the stomach was found to be empty in the time when the lowest value was reached. This can be taken as indication that a rapid passage of the stomach contents tends to bring about a greater fall of the blood sugar in the hypoglycemic phase.

In cases of gastroenterostomy the rate of passage varied but it was in general more rapid than usual. Aspiration was undertaken in 43 tests and in 26 of these the stomach was empty in one hundred and twenty minutes or less after ingestion of the glucose. The results of aspiration and x-ray examination did not always agree. Neither were the results of aspiration in the same individual always found to be concordant in the different tests.

In 4 of 26 tests which showed rapid emptying (with one hundred and twenty minutes or less) the blood sugar reached pathological values. The same was seen in only 4 of 25 tests with slow passage. Two of these tests moreover were made on the same patient in whose case a complicated factor (pelagra) was present which may have accounted for the pathological results. In the remainder of the 4 tests the hyperglycemia was only slightly pathological. In these investigations it would seem to be proved by experience that a rapid emptying often but not always leads to pathological hyperglycemia after the ingestion of glucose. This is disproved by the patients that have been found as other factors besides the rate of emptying have influence upon the blood sugar rate.

Special note was taken of a case which was better suited than any of the others to illustrate the influence of gastric emptying on the glucose tolerance curve. In this subject a gastrostomy performed twenty years earlier was put out of function by ulceration. The emptying of the stomach could no longer take place; a normal man either the pylorus. X-ray examination before the operation showed rapid passage through the anastomosis. This finding agreed with the results of aspiration while by the stomach was (3 percent) found to be empty seventy-five to ninety and hundred and twenty minutes respectively after the ingestion of glucose. In these 3 tests maximum values of about 0.300 percent were found but in spite of these high values the duration of the hyperglycemia was normal. After the operation 6 to 12

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A m a g t h e 95 i n d i v d l w t h a r e t d t m a b
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b j e c t s w t h c t e d t o m a c h p c a l f t n t
a s d i r t d t o c a s e w h c h w p a t c u l a r l y w e l l
t e d t l l s r a t t h l a t n b t n r p d p a s s g
a n d s n t h b l o o d g a r I n t h c a t t l g a s
t e c t m y h a d b e n p r f r m e d c c t f c a n

I n t l r a t e s t t h b l o o d g t h c o u r s e
o f t h i r t y m i n u t s t n e a l y 300 p c e t O a s p
r a t n d u i n o i f t h t e s t s t h g a c t i o n w a
g a t u a l e a d y a t t h f i r s t x a m i t n f o r t y f i c
m t e a f t t h b g n i n g f t h p m t

O t h r v e u p t e o f r a p d e m p t y i n g p a t h l g c a l
h y p g l y m i a n o t f t n b r v d f s e t
t o f t h t m a c h a f t e g a t r o t s t m y T h
n i f t h i s i s n t q u i t c l e I t s p o b l e t h a t
t h d u b l p g i n c a o f g a s t r t r o t o m y
t h u b t h e t o m i s a n d t h r u g h t h p y l r u s
m a y h e f i n

I n t h e h y p o l y m u p h a s h w t h e f i n d i n g s
a f t e g a s t t r o s t m y a n d a f t e r e s c t i o n m
c o c r d n t A s p i r a t i n t h e s e c t e d c a s e s a l s
h w t h a t r a p d e m p t y i n p d i s p o s e t o g r e t

r t i f l l b l d s r t h w h n t h e p r
n t i m e w a s o b n d e d a d t w e n t y m i n u t e s
l e s s a f a l l t 65 p c e t o l e s s v a o b s e r v e d n
20 f 43 t t A s m i l a r g a f f l o c c u r r e d m o
r i f t t s w i t h s l o w p a s s a g T h u s t i s s e e n L
n c e p t i o n a l c a s e s l o w b l d s g a r v a l e s m a y b e
n o t d t a t i m e w h e t h s t m c h s t i l l c o t a m
s u r U d e r t h e s c m t c e s h y p o g l y c e m
s y m p t o m s h a v e l i k e w r a r e c a s e s b e e b
s e r v e d T h i s h w s t h a t t h g a t r i c m p t y i s o f
o n f t h m a n y l a t e r s t h t b a n i n f l u c e s
t h b l o o d g a r c u r v e

T h s i g n i f i c a n c e i f t h r a p d e m p t y i n g i f t h e
c f i r m d b y t h l t s f d d a l a d m i n t r a t e q
o f g l c o I n c a s t h a l q a t y i g l o s e
m i p e c t s l t n w c o y e d d r e c t l y t o t h e
d u o d e n u m b y m f t b t h e l o c a t i o n o f h o l d
a s a s c e r t a i n d b y x r a y e a m a t i o n F o
p a r i s o a n o r d i n r y p r a l t l r a n c e t e t w a s m
n a c h a s A f t d d a l g e s t i f t h e g l u c o s e
t h b l o o d s u g a r n v b l y r o s e h h a d i n y d
t h t e s t s i t c h d p a t h o l o c a l a l e s T h
b l d s u g r f o m r a p d i d y b u t t h d u r a t i o n
o f t h b y p e g l y c e m w a s o t l t e d T h e h i g h
r w a o t s u d d b y g t r f l l t h h y p o
g l y m c p h a e I f t h b j e c t f r m a t o r
y m p t m s o f h y p l y c e m a p p r d d n g l
p a l t e s t w h i l s u c h s y m p t o m o c c u r r e d i
n g t h d u o d n l t e s t s

I n d e t l e d t f r t h e r t h r e l t o b e t m
t h g a s t c e m p t y d t h e g l s t l r e c t r
a t e s t w m a d e i n p a t i e n t w t h p y l n e s t o s
a d a l m t t t a l g t r e r e t n t n D r i n g t h f i r s t
n u n t y m i n t e s t h b l o d g a r r m a i n d l m s t e n
a l t e r e d a t a r o u n d t h f a s t i n g v l s o t h a t t h m i n
m u m e c a m i t e a d d d t x c d s p e
c a n t T h e w a s o h y p g l y c m i c p h e

F a l l y t h a u t h c a l l s t e n t t o t h m p o
t w h h r p d e m p t y i n g m y b e t h o u g h t t o
h a v e g d t h a b r u p t i o n n t h i n t e s t u l
p o n t d u t t h a t n c o c l s s e p e t i n g t h
r a t f s t t a l b a r u p t i o n c a b e d r a w n f r o m t h
r s b l d s u g a s t h m a x i m l a l e a f t e r t e
i n g s t n o f g l u c o s l d p d n t p o t h n t
o f r e m a l o f t h s u g f m t h t u s u I a s e r e s
o f p r m t s n w h c h t h b l o d u g r w a s e
a m a n d b o t h n c a p i l l a r y a d i e n s b l o o d n
s h w n t h a t t h e c a p i l l a r y v o s d i f f e r e n c e w a s
t h m e p e r s w t h g t t e t m y r
s c t d s t m a c h n o m a l i n d v i d a l s T h e h e r
e c a t h f e n t b e d u e t o t h e f a c t t h a t t h
g w a m o v e d f m t h e b l o o d m e s l y t h i s
u

T h e t h e m t h p o b l i t y f a m r e a p e
a b r p t n t h t e s t C e t a u p h y o l o g a
o b r v t n s h w e w l d m t p e a k a g e
t h u p p t n t h a t r a p d e m p t y g o f t h s t m a c h
m h t e d t i c e d a b s o r p t f t i s k n o r
t h a t g l u c a n d t h h s e s a l s o b d s e l e c
t v l y n t h i n t t T h r a t o f a b s o r p t i o n i s t h e
s a m e w h t h r m c h l i t t l e g i s p r e s t l
d t b r i n g t h s f c t t o a c c o d w t h t r e s u

of the present investigation it is assumed that only a limited part of the total surface participates in the absorption of nutrients. In case of rapid emptying large quantities of glucose pass at once into the intestine and the latter is disturbed over a wider surface which is thereby brought into contact.

A rapid emptying of the stomach proposed by persons with a gastric ostomy or resected stomach more frequently shows a great fall of blood sugar in the hypoglycemic phase than the normal. It is known that the absorption of glucose takes place very rapidly. When the gastric emptying is rapid the absorption will be completed more quickly than normal. Meanwhile the mechanism which regulates the blood sugar after absorption acts somewhat tardily and thus applies also to the factors which bring about the reactive fall. When the gastro-intestinal activity becomes empty sooner than is normal no sugar is present which can compensate for the fall in blood sugar.

N. v. P. Römck, O. and Svaa, Seljesetter, O.
Result of Medical Treatment of Gastric and Duodenal Ulcer. *Acta med. sc. d.* 943 3 444

During the six and one half year period from January 1935 to June 30, 1942 patients with gastric or duodenal ulcer constituted 10 per cent of all admissions to the Drammen Hospital in Norway. The great importance of treatment in this condition is therefore evident but so far there has not been general agreement as to whether the preferred treatment is medical or surgical. With a view to a solution of this question the authors studied 382 patients (15 with gastric ulcer, 23 with duodenal ulcer). Tables and graphs showing the results of the study are given.

At the hospital if perforation is not surgically indicated the patient is admitted to bed with a diet of milk and food. If the patient is in pain, metemesis, prolonged food aversion, or the amount is small at first and it is increased gradually. Regarding examination to decide before and after treatment. On discharge from the hospital the patients are advised to keep quiet for two weeks and to observe a careful diet for a period of one year. They are requested to return at the doctor's office for clinical and roentgen re-examination.

It was found that the shorter the history of the disease the greater the prospects for cure. The treatment in cases where the patients had had the disease for less than five years fully one half the number of patients with gastric ulcer and about 40 per cent of those with duodenal ulcer became symptom-free. If the disease had persisted for five years more, only about one fifth were freed of symptoms. Regarding examination: showed that twice as many of the patients with large gastric ulcers of those with small ulcers could not tolerate treatment. The degree of dependency of the blood had no significance in prognosis.

The authors conclude that it is very important for patients to come for treatment as soon as possible. If they have had the disease for the first time and for less than five years, diet treatment should be given. In cases of recurrence operation may be indicated but these patients often refuse operation until another trial of dietetic treatment has been made. If the patient is free of symptoms after a moderate change in diet operation will generally not be necessary but other factors influencing the decision are the nature of the patient's work and his economic condition.

If the patient does not come for treatment until late operation should be recommended particularly in cases of small gastric ulcers and duodenal ulcers and especially if the patient has not remained free of symptoms after dietetic treatment. For large gastric ulcers in which dietetic treatment gives the best results and the operative risk is great, operation should be recommended readily although the possibility of cancer in cases with large gastric ulcers must be remembered.

Operation is to be recommended more readily in duodenal ulcer in case of the greater risk of recurrent hemorrhage and the greater possibility of perforation. Also the majority of cases of duodenal ulcer are in men and as they work outside the home it is harder for them to regulate their diet but duodenal ulcer usually occurs at a young age when the operative risk is not so great.

An ideal treatment is impossible although the etiology of the disease is unknown.

ANDERSEN, G. M. and M. D.

Sanguily, J. and Bianco, F. L. Gastric Schwannoma. *J. Surg.* 945 7 328

Non-papillary benign tumors of the stomach are very rare but neurogenic tumors are even rarer. The type of morbid change by the authors is known in the medical literature by many names because of the different microscopic aspects which it may present and the different descriptive opinions explaining its nature. Those on dering it connective tissue or ganglioneuroma, fibrosarcoma, others associate it with the nervous system and designate it as a neurofibroma. The type described by Schwann is called schwannoma and Lemmon as desmoma. Authors who consider Schwann's cells as neurogenic cells (peripheral neuroglia) term these tumors peripheral glioma.

The authors report a case of large submucosal benign tumor of the neurogenic type (schwannoma) in a fifty-eight year-old negro woman. For many years she had had a discomfort in the left hypochondrium which tended to epigastric maddening like a ball. This was associated with heartburn, nausea, a constant feeling of distention. Her appetite was good and there was no pain. The pigastrium showed good position when it was in the right side of the patient became uncomfortable but when he was relieved by palpation especially when she had eaten. She rarely vomited but had lost much weight.



Fig. Lat 1 view f th t m h w th b num m 1

B cause of its ontg n l g cal latur s and fe
ympt ms the t mo w m tak f r a tr
ga t h z ar The clinical ympt ms f the c t o
c dit s are not ufficent f a accurat d g n
n wh ch is qu t dfficult with t ro tg mach
cale am n to B nig t mors of th st mach e
a d only in l rge nea can ch a d ag os be
up ted Most b n tumors e f u d t the
gre t r curvat e t th fu d at th pyl
d f the stomach Of all be g tumors th e
mo t as ly d agno d th gast p lyp heca s f
t g t c a y m p t o m s a d beca t d e g n t e s a d
ulce at When b g gast tumors l cated
ar th pylorus th y p o d a ly symptom f
st no h ch s gg st t the phy a th d
f r r o t g n o l o g c a l v e s t g t o O th th r h d
f th b n i g n t mors s m l l d at d i s t a c e
f m th pylorus they m y p e s n t f e r n g
t c y m p t o m s

In the a thors ca the o t n o l g c a l e a m
t o n r a l d a n t r a g a s t r i l e s c u p a g the
c t c a t v A g a s t r i c n p l a s m s e m d u n l k l y
b c a u f i t h f w g a t c y m p t m a d t h f c t
that th l u t r y e a l d t h t t e t m o h d b
p e s t f a y e O th the b a d t h c l n c a l
p t u e g t r b z o r s d e l p s m d l y a d
ther f e f a y y m p t m s the f o e i t s m d
l k e l t h t g a s t r i c b a r s w r e p e s t

When the b e n g t u m p e d u n c u l t e d d w v
f m th pylorus a e l a t i v e l y s m p l o p e r t n a l l
that n e c e s s a r y I f t h t m i s e a t h p y l r u
p d g s t c o s r i f t h e c s t h e l g h t p o
b l i t y o f c a c e r a p t a l g a s t e t o m y s s c o m
m e d e s a l W h t h t u m r d o e s n t e t d
n t the g a s t r i c c a t v n l l i p t c a l e o n i s m a d e

th ough the g a s t r c w a l l a o u n d t h e t m a d t
r e m o v e d s t o l o Th p e n i n g o f t h e s t m a c h i s t
c l o s e d i n l a y e r s

The g a s t r c n p l a s m w a s r e m e d h t h a l
t r n g a s t r c a l l y t h g h a n a t i o g a s t r t l
p i t e o f c a f u l h m t a s i s a d a o t h r u l r u
c o n v a l e s c e c e m i e g a s t c h m r i b a g c c
c u r r d n t h e t e n t h p o t o p e r a t e d y c a l e i c e
t h r u l e w a s n o m a l J o K N a r M D

K p l n H S and R i g l L G P e r n i c l s A m
m i s a d C a c i n m a o f t h S t m h—A c o p e r
S t u d i e C o n c e r n i n g T h I r I t r r l t i n s h i p
A m J M S 94 09 339

Data i n t h e l t e r a t u r e i d c a t e t h e p a b u l i t y
p e r m e o u s a c e m a a n d c a r c i n o m a f t h e s t m a c h
q u e t l y e c r n t h e s a m e i n d i d u a l

T h e r e a s e v e r a l t h e o r e s a s t o t h e r a s o n s f L a
c c d c f t h e t w o d s e a s e s

I a s t d y f 2331 a u t o p n d i d u a
f t y f i e y e a s f a g e o r o 93 c a s e s o f p e m
a n e m a e e f o u n d T h r t y f t h l a t t e
l p t d c a r c i n o m f t h s t m c h s m h o
d e c o f 3 p r c n t w h c m t h a t h r e m o n
g a t a s t h i c d c e t h r e m a u t p e
f d i d a l s f t h s a m a g e

U e q u a l l y t h e t a t t c s i n d c a t e t h a t t h n
n t o l o g c a l l a t s h p b t w e e n p e r m e o u s
a m a a d c a c i n m a f t h e s t o m a c h

P t e n t s w i t h p r n c u s a n m a s h l d t h f
b a m e d f q u e n t l y t o d e t e c t t h e o e t i m
c n m a o f t h t m a c h H a z z W F e x M D

R o C D i v t i u l t i I n d i c a t i o f r R c d
S t h M J 945 38 65

T h a u t h o h e c e n t l y s e c u r e d t h c u r r t o p
i o n f a p e t a t t e g r u p o f p e t l t o b
d o m a l g s a d g a s t r o e n t e l o t s o n t
s u b j e c t o f d e r t i c u l i t s T h e r e p l s i d c a t a d d
n t e a d d e s p d t r e n d t w a r d t h m r a d c a
s u r g e r y e s s e n t i l t h p e r m a e n t r a d i a t i o n o f
l e s o n w h i h a l l t h e r w s e s e r v e a s a c h r o i c i o n s
i n f e c t i o a c n s t n t b a t o p p e f m n a t a d s
o n t i n o s o p p o t t y f o r p e n i l s i t r a a b d m u c a l
m p l a t i T h a t h o s n o b s a s o n s m
e c t y r s h a c f i r m d t h w i s d o m o f L a
c h a d t i t u d n t h p a r t o f s g o n s a n d d e
e d g m t f c o l o t h t h a c b e e e m e
h a t h e m s l e d e m t r a t d t h e n c s s t y f r t
c t r p a t i

S e l y r s a g o t h e a u t h r a d o c a t e d t h e
w t h a d a t p o l y c y a d f a r d t h u e o f t
D e c t y p f i t a s s e c o l o s t m y b e c a u s e a
p p e a d t l t i a s m r e e n d b l e a r t i c u l a
a n u s t h a t h l d b l e b a r l d t W h e n
v e r y r e c e t y r s h o w r h b e r a d i n h i s
w r k t h a d i d l s w t h t e n o s i n g d r u g u a s
w h o c a r r d c f t o m y f o a p o l g d p e r o d a
o b t a i n d d f i t c e s o f t h e t m f a t i o n a
p r o b a b l y s i f f i c t c e a s t h e c a l b e o f L e
b o l l m t o p e r m t c l s u o f t h e c o l o s t m y e t
a f r e q u e n t l y p e s e t d t h m l y e s l a t e r w i t h d s

tu b g recurr s f their d s ase The inflamma tory react n m y r ppea the tum fa t n may recur and by ts l escent into the lo e p lvis pro duce angul tion a d pain r the patient may suffer f m chronic obstipa o

It is agreed that th m jor m nif st tions of di vert culosis occur in the sigmoid re ardless f the e t nt f the preceding d verticulos s This locali tion is appa ntly d to the smaller howel cal ber the presence of firmer fecal masses wh ch ar more lik ly to produce fecaliths in the pock t and the tend ncy of the bolus t be retained for long per is above the rectos gm d canal For th s ason e turpat n of i l ed segments i th area gives p om e f pe ma e t rel e f om serious compl ca tions

We k w th t bleeding f om the h w l may be p odue d by both d verticulitis and ca cinoma and that d rt culosis may coexist with mal gna t tu mors The absolute d fferentiation betwe n the two conditi is not alw s possible

A method of ma gme t which impo s a waiting p riod f from ni e to twel e mo ths foll w g the construct on of a c lost my for di crtical t s h fo e e etio is dec d d upon places an unw ranted b den upon the p tient and leaves the qu tion of a p able additi al les n unsolved

With all of th inf mation afford d by procto sc p e e aminat roe nograms and lab ratory findings p evious to celotomy thes geon sh uld be e mpet nt to dete mi with the added be fit of m im m e plorat on of the tumor whethe o not resect s i d cated If resection is to be do for d ve tiel t s the co dition of each pat nt follow ing the col stomy sh uld determi the l gth of the i terval bef e the les on is remo d

JOS PH K N RA M D

Rees V L R gl n I J Junitis R po t f n Un u l Case Am J S t 945 67 9

N sspecific i flammatory eo d tions f th tes i l t act are not ra but it is nus l to see these co ditions in the pper gast on test l t act with ut a s milar path l g cal eo d t ion in the terminal ile m Likewise thes i fl mmat ryc d t o s s l dom cause complet i testinal obstruct n No sspecific inf mmatio s f the gast t tinal t a t occur most f eq e tly i the reg on f th termi al il um This dise s d t butes itsell e th gion ally or diffus ly th o ghout the g str nt in l tract When the d ffo e type is e c untered th majo p thological ch nges a eus lly l cated nea th distal ilum It is u su l to s the p m l jeju um in ol ed witho te ide ce fa s m l rpr e ess m r dist lly

Th author describes n unus l cas of n sp cific reg nal jeju it s n which the p o m l j j num w s completely obst uct d t th ce s l t ed places Ab o t s feet of j j num w e s t d a d n end to s d ast mosis w s p rformed Th pati ta reco ery was u e t f l d she is ell d symp tom free one year lat r

Th gh this les n is obstructive in nature it sel d n causes as complete an intestinal obstruction as as illustrated by this case Even in the more se

cases a narrow chan el can usually be demon strated i ther entg nogram (stri g s gn) The gen eral d nutritional edema present in th s case un doubtedly contribut d to the c mpleteness of the obstruct On exam nat on of the g s s patholog cal pecimen there w e found at l st thre areas of constr ct o ith isolated elo ed segments of sm ll h wel that were greatly diste d d w th fluid and g s These isolated distended loops d d not collapse u t l the constricting eas were incised The seg m t l distribut n of the ulcerated consticting a e s with u involved i testine i terven i g is eha acie ste of the segm ntal type i th s disease and illust tes the so-call d sk p areas

Usually the jejunal variety of this d case is not ame able to surgery as the process extends ov such a long segment that resection or s de track ng p rations sho ten the gastr ntestinal tract too m ch Because of th c mpleteness of the obstruct ion in th s case it w s imperative that someth ng be done In view of the two isolated obstructed loops f small bowel resecti n seemed to be the only ra t nal form of therapy

In cases in wh ch the inflammatory process is l mited to the te minal ileum exel s on procedu es re often done but ult mate resect on is usually i dicated In op rating upon patie ts with th s con diti n one must rem mbe to d vide the bowel w ll above the i volved port on in order to avoid recur re e s When a res ct n is p e formed the mesen tery n ed not be res ct ed deeply as the disease does n t sp ead vi the lymphatics as was once thought Th fact that a ye has pass d s nc op ration and th are o sig s of r currence m kes the progn o s in th s case q u t hopeful When recurrence s appear th y us ally m nifest thms lves with a y and p ctically always appear b fore two years

CH RLES BARON M D

Spellberg M A and Gray L W Region I En t ritis of th P xim l Jej num foll wing Trauma S gery 945 7 343

The case of g nal ent ritis reported he e is f i t est ot o ly because of co fi m nt of the p th log cal pr cess to the most p oximal port on f th jej num but al o because the preceding trauma may ha had a etol gical relat o ship to the l sio A twenty three ye old soldier was hospital ed f i l ries s stain d when his motorcycle ran n to th rea end fa t ruck H s princ pal c mplaint was eve e g neralized abdomi l pa n which appa ntly was not cr mpl ke He al o usta ed injur es t the f c with fra tu e of the fa al bones a d a f act re of the fifth rib Exam at on r vealed n v s bl sign f abd minal wall co tus on a d o e i de f f e e a i th pert cal cavity Th abd minal pa n subs d d within ni e days D ing this pe iod he vomit d o ly a few times a d c tinned hav bow l move me ts nd t pass fl tus

Seven weeks later he experienced the first recurrence of abdominal symptoms. These were relieved for the most part by a saline cathartic and enema but residual abdominal tenderness persisted. Then during a thirty-day interval he became much worse with vomiting after nearly every meal and abdominal pain.

Physical findings were indefinite but inspection of the gastric test indicated that with barium hydrochloride latent of the stomach and duodenum and almost complete arrest of the peristaltic movement of the ligament of Treitz. Distal to this point about 12 inches the jejunum showed stenosis and absence of peristaltic waves and marked tenderness. About three months after a jejunal exploratory laparotomy revealed a lesion in this area resembling that of subacute nonspecific regional enteritis. A short circuit gastrojejunostomy was done to put the involved portion of the bowel at rest and mesenteric lymph node was removed for biopsy. After a good postoperative convalescence the patient's food intake became limited because of postprandial epistaxis. Five months after the first operation the gastrojejunostomy was taken down and the first 12 inches of the jejunum were resected with end-to-end anastomosis of the esophageal segment. There was no evidence of skip areas. The pathological diagnosis was chronic regional enteritis.

The possible etiologic relationship of trauma to regional enteritis is discussed.

JOHN L. LEVINE, M.D.

Elmer R. and Red J. A. Nutritional Requirements of All but 3 Feet of Jejunum and Half of the Colon. *J. M. A.* 945:4-45.

A thirty-two-year-old man had had many previous operations for regional ileitis beginning in 1933 during the course of which two segments of the ileum were resected. He had been asymptomatic for more than a year. Several months before admission to the hospital he began to suffer abdominal pain in the difficulty in moving his bowels. At other times he suffered from severe diarrhea. He then developed mesenteric right iliohypogastric which finally came to a head and developed fecal material and pus. Shortly afterwards he had gas and calm palpation, gas, and the upper right iliohypogastric persisted. There was a loss of 50 pounds in weight.

Abdominal examination revealed moderate tenderness in the right iliohypogastric region. Contracted bladder with cystitis and no distention at the point undoubtedly the abscess in the right iliohypogastric. Iliac fistula with pyoderma led a connection with the urinary bladder and with loops of small intestine and the existence of large calyces in the upper part of the pelvis behind the bladder.

At the first operation 3 feet of terminal jejunum were observed to be mesenteric in the ileum.

Test and all of the small testicles of the small length of normal jejunum as demonstrated by the colon. The colon as normal with the patency of the distally because no other procedure was made possible the jejunum as demonstrated at the point where it became diseased its central distended and a isoperistaltic side-to-side anastomosis as made between the jejunum and the ileum by the transverse colon.

It was deemed in the abdominal cavity the ileocecal anastomosis at the time because of the presence of the large external abscess in the pelvis. The effect of the operation as to mention at this point the results of the use of loops of the small intestine which had been opened and the results of the peristalsis. The abdomen is all closed but through and through staples steel sutures replaced close together. The colon is from the peritoneum uninvolved and undoubtedly as a chemotherapy with both the sulfa drugs and penicillin and by complete parenteral alimentation with amino acid glucose electrolyte and vitamins and the mineral solution of the whole blood.

Nine days later the staple steel ileocecal anastomosis was removed the peritoneum was entered and the anastomosis is located in the interval of the jejunum and the hypopharynx distal to the cecum. The colon was distended the right iliohypogastric anastomosis distended and a total cure of the ileum in the colon and small intestine. This question of the distention of the superior mesenteric artery. As the distention approached the pelvis a large pelvic abscess was encountered the contents of which were evacuated. When a leakage to the peritoneal cavity in the bladder was observed the mass of the distention as removed in pieces. The abdominal cavity closed through and through staples less than the incisions. In addition to blood transfusion and intravenous fluids the chemotherapy was continued. The patient died. Food as started by mouth and the patient made an unventilated recovery. The hospital stay in ten days later the patient died. The wound healed completely except for a fistula in the abdomen in the eighth day. The patient died with difficulty.

Apparent on was felt that the person had only had 3 feet of small intestine and the ileum of the large bowel would have given the difficulty of absorption of food. However, the patient on the improved diet with the use of a peroxide of iron. The patient gained 40 pounds. The month later he was 14 pounds. The malabsorption fact that the patient had restricted diet to 500 grams he pleases the patient's diet. The patient died.

STEWART, ZIMMERMAN, M.D.

Frühling, S. Diet and the Celiac Disease. *M. A. M. Thod.* 945:83.

This is a case report of a thirty-year-old male patient with a diagnosis of celiac disease.

was operated on through a McBurney incision. On delivery of the cecum the appendix appeared on the left but the lower mesocolic side of the cecum appeared to contain a large tumor which was incised to take a biopsy. During the history the cancer was carried down to a black gangrenous mass which proved to be a solitary gangrenous diverticulum. Removal of the ganglion and diverticulum and surrounding tumefaction would have made it mechanically impossible to close the cecum. The area as therefore closed by suture in the peritoneum to the granulomatous wall of the cecum around the base of the diverticulum. The cecostomy has been closed gradually.

R. C. B. N. G. N. Surgical Lesson of the Right
Colon J. M. A. 945 7 583

Although only one fifth of the cancer cases are found in the right colon the caecocolic is the location of the majority of those inflammatory pseudotumors of the abdomen which require surgical treatment. Tuberculosis simple ileitis and nonspecific granuloma of the colon must be considered in the differential diagnosis of the conditions of the

Hypertrophic tuberculous of the intestine restricted chiefly to the cecum was first described by Henshaw in 1891. It is frequently primary lesions. The tissue changes are characterized by cellular infiltration and extensive fibrosis with consequent thickening of the wall and constriction of the lumen. The symptoms are local tenderness and pain occasionally bloody stool and distention. If the disease involves a limited area of the large bowel complete section is indicated.

Simple ulcer of the cecum was first described by Cayo by C. Veilher. The great majority of cases which have been reported of the ulcer have been in the mesocolic side of the cecum near the valve. The cause is unknown, the diagnosis is in no instance has been made before celiotomy or autopsy and every patient not operated on has died. While statistics have been reported in the literature it is probable that numerous unreported or unrecognized instances of this disease have occurred. The condition is encountered both acutely and chronically and may first present itself in an acute inflammatory phase which rapidly perforates in common with the stage the symptoms resemble those of acute appendicitis with pain, nausea, tenderness and local tenderness. The usual preoperative diagnosis is diverticulitis. These circumstances have been pointed out. In the ulcer the acute stage effectually. A second group of fecal lesions is the cancer of the colon which has become chronic—often after partial perforation has occurred. The reported history of the presence of metastases in the case of abdominal tumor, the tool of diagnosis in the lower part of the abdomen is a digital defect in the cecum limited in an almost invariably preoperative diagnosis of cancer. In the chronic stage resection of the cecum usually necessary.

Region 1. Left side of a granulomatous proliferative process which involves the ileocecal valve and extends upward along the terminal part of the ileum distally to the cecum and ascending colon. Frequently and this is in part responsible for the suggestion that regional enteritis is a better name for the lesion. Its syndrome is characterized by pain in the right lower quadrant of the abdomen, diarrhea, fever, occasional obstructive phenomena and the formation of fistulous tracts to nearby viscera of the abdominal wall. Young men are commonly afflicted. In the acute form the bowel is edematous and adherent to the omentum and adjacent peritoneum and is associated with soft enlarged mesenteric lymph nodes. When the chronic process is established the patient has lost appetite and weight, he has a chronic complete obstruction and is frequently a palpable mass which consists of gray soggy edematous adherent terminal ileum and cecum. The treatment is surgical and consists of radical removal of the portion of the bowel involved.

Objectives have been raised to differentiate from this granulomatous progressively extending and malignant disease involving the bowel wall a rarer group of masses localized nonspecific neoplasms which occur in the colon and in other portions of the bowel. However, Cohn believes that although the etiology of the masses may well be the same the gross appearance, anatomical location and dissimilar method of growth of the two warrants separate consideration. Localized specific granulomas of this type while of unknown origin and present in a microscopic picture somewhat resembling regional enteritis do not cause diarrhea, stricture and fistulous tracts, they tend to increase in size while remaining at one area, the bowel is difficult to suggest a clearcut diagnostic differentiation between cancer and these inflammatory conditions because of such common factors as tumefaction, similar roentgenographic appearance and chronicity. All of the latter bowels are usually associated with some temperature elevation and with increased leucocyte count, a emesis not pronounced and the tumor usually moves it. It is perhaps quite fortunate that surgical intervention is indicated in each of these conditions because if a patient has a condition extending a distance preparatory to the colon, second essential in surgery of the large bowel before the abdominal mass is not any discrepancy in the operative diagnosis can be safely corrected at the time of the preoperative diagnosis.

CHARLES BARRETT M.D.

Pugh H. L. and Nelson J. P. Multiple Polypoid Diverticula of the Colon and Rectum. A. S. 945 88

Adenomatous or multiple polypoid diseases of the colon and rectum are a benign condition. Malignant transformation is inevitable and early age is practically 100 per cent of such cases.

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JO EPH GASTER M D

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JOHN L. LINDQUI M D

LIVER GALL BLADDER PANCREAS AND SPLEEN

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The recognition of sickle-cell anemia as a cause of acute abdominal symptoms is important in order to avoid unnecessary operations. The mere presence of biliary calculi in a patient with sickle-cell anemia requires careful evaluation of the abdominal symptoms before patient admission to the hospital.

Therefore cholelithiasis in the negro, especially in the young negro, always demands a search for the presence of sickle cell anemia.

EARL O LA MER M D

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The literature on the subject of primary cancer of the gall bladder is reviewed and a case is reported and discussed. A review of 18 cases seen at the Institute of Clinical Medicine, Buenos Aires from October 1919 to July 31, 1944. The frequency of this form of cancer was 5.1 per cent of all the cases admitted during this period. 99 per cent of the cases of benign disease of the gall bladder and 39 per cent of the 455 patients with gallstones. Of the patients 72 per cent were more than fifty years of age and 5 per cent of them were females. Two patients survived long enough to have the operation. The other 453 were females.

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in 89 per cent of the cases there had been a previous history of benign dyspepsia in 67 per cent of the group the disease was typical hepatic in character in 67 per cent dyspeptic symptoms and in 1 per cent latent lithiasis. There was pain in 67 per cent of the cases. Obstruction of the small intestine in 39 per cent of the cases and loss of weight in 89 per cent.

The clinical picture of beginning cancer of the gall bladder may be similar to that of benign disease of the gall bladder and as a rule a definite diagnosis is impossible without pathological examination. The suspected diagnosis is supported if in a patient with a history of cholecystitis the pain and dyspeptic symptoms recur and become more evident. In 67 per cent of these cases the diagnosis is confirmed, that is, after the beginning of the disease.

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practically impossible. Irrigation of very gall bladder that contains stones has been recommended as a prophylactic measure. This is hardly justified as the frequency of cancer in gall bladder decreases (from 1 to 3 per cent), less than the mortality from cholecystectomy and even if the gall bladder is removed cancer may occur. The stump of the cystic duct. However, the possibility of the development of cancer in patients with gall stones should be taken into consideration in determining the indications for treatment of the latter disease.

ANDREY G. MORGAN, M.D.

Irwin S T and Morin J E Congenital Cyst of the Common Bile Duct Containing Stones and Underlying Cholecystitis *Br J Surg* 1944; 31: 310

The authors report the case of a thirty year old male who was operated upon because of pain in the upper abdomen and rigidity of the abdomen. The cholecystogram was normal. Through a grid roentgenograms on the appendix was removed.

Approximately fifteen months later the patient was operated upon again because of recurrence of pain in the right upper abdominal quadrant and jaundice. The gall bladder was somewhat distended and the liver was tense. There was a large tumor about the size of a fist in the region of the head of the pancreas. This was aspirated and found to contain bile. The cyst was opened and gallstones were removed. Then a tube was sewn into the common duct and a choledochostomy performed. The patient failed to survive.

Autopsy was performed and the cystic and hepatic ducts were found to be normal in size. The common duct was dilated but a probe could not be passed into the duodenum. Histological examination revealed a squamous cell carcinoma which was believed to have originated in the common duct.

EAR O L TIME M D

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still have been observed. However, the gallbladder is not the only source of infection. The cases also show that the infection can be introduced into the gallbladder from the biliary tract. In such cases, the infection is usually introduced into the gallbladder from the biliary tract. In such cases, the infection is usually introduced into the gallbladder from the biliary tract.

The cases also show that the infection can be introduced into the gallbladder from the biliary tract. In such cases, the infection is usually introduced into the gallbladder from the biliary tract. In such cases, the infection is usually introduced into the gallbladder from the biliary tract.

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The author reports upon a series of cases of gallbladder disease. The cases are divided into two groups: those in which the infection is introduced into the gallbladder from the biliary tract, and those in which the infection is introduced into the gallbladder from the blood. In the first group, the infection is usually introduced into the gallbladder from the biliary tract. In the second group, the infection is usually introduced into the gallbladder from the blood.

The study is made of 26 private cases of gallbladder disease. The average duration of symptoms is 15 months. The average age of the patients is 45 years. The average duration of symptoms is 15 months. The average age of the patients is 45 years.

One hundred and three patients (4 per cent) had one or more complications at operation. The complications included acute cholecystitis, acute pancreatitis, cholelithiasis, and carcinoma of the gallbladder. Where the average duration of the gallstone disease was four and six tenths years, the complications were absent. The average duration of the gallstone disease was four and six tenths years.

Sixty-nine patients (27 per cent) had acute cholecystitis. The average duration of the gallstone disease was four and six tenths years. The average duration of the gallstone disease was four and six tenths years.

Although the general treatment of gallbladder disease is not discussed, the author reports upon a series of cases of gallbladder disease. The cases are divided into two groups: those in which the infection is introduced into the gallbladder from the biliary tract, and those in which the infection is introduced into the gallbladder from the blood.

Shock. The author reports upon a series of cases of shock. The cases are divided into two groups: those in which the shock is caused by a surgical lesion, and those in which the shock is caused by a systemic disease. In the first group, the shock is usually caused by a surgical lesion. In the second group, the shock is usually caused by a systemic disease.

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Attending to the cases of shock, the author reports upon a series of cases of shock. The cases are divided into two groups: those in which the shock is caused by a surgical lesion, and those in which the shock is caused by a systemic disease. In the first group, the shock is usually caused by a surgical lesion. In the second group, the shock is usually caused by a systemic disease.

MISCELLANEOUS

Bennett, J. Abdominal Pain in Child. J. Am. M. A. 945: 769.

Abdominal pain in children is a common problem. It is usually caused by a surgical lesion, such as a hernia or a tumor. It is usually caused by a surgical lesion, such as a hernia or a tumor.

Brumfield, J. Abdominal Pain in Child. J. Am. M. A. 945: 769. The author reports upon a series of cases of abdominal pain in children. The cases are divided into two groups: those in which the pain is caused by a surgical lesion, and those in which the pain is caused by a systemic disease. In the first group, the pain is usually caused by a surgical lesion. In the second group, the pain is usually caused by a systemic disease.

the obstruction. If it is sudden and complete the pain is agonizing especially at the start and there may be sickness. This is known as colic no matter what the underlying cause. There is very little tenderness. Pressure is often a source of relief and is not infrequently self applied.

If the obstruction is spasmodic and gradual in onset the pain varies with the degree of obstruction. It is always intermittent; it may be almost negligible yet it may be severe. Hyperperistalsis and distention finally atony if too long continued supervene proximal to the point of closure. Hereas atony and contraction occur distal to it.

Conditions due to infection the pain is more constant and uniform less the e is c neur ent ob struct on Intermit tent period of gre ter pa n w then man fest them self s Tenderness is lways present over the affect d area a d i more pronounced than unelic ted pain

CONDITIONS PRODUCING ABDOMINAL PAIN IN CHILDREN

Obst et s Amo g the congenital intestinal obstructions are those due to atresia and stenosis bands or rotation of fetal peritoneal malrotation of the midgut and meconium ileum which the es is an almost ir movable rubbery mass of meconium throughout the intestine it act du to a pancreatic deficiency

Pyloric st nos s I pylor c st n sis ther is a gradual and part al hstruct on There s th efo e only slght pn n usually ot ro gh to m ke th e n fant cry Th re is only n obvious d omfort as show by the wrinkl d br the l o k of apprehension d the st pping of urs g s e ch new p sode occurs c c d tal with the app ara ce l ma imal persist ltic gastric va es a d the app oach f proj c tle vomit g

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most frequently occurring type of acute testis
obstruction is retrograde ejaculation after the first year
of life and especially after the end of the first year
no other condition does this usually result
except at which the patient began the oral
symptoms the patient becomes less severe as a rule

the child does not cry out as before. With each recurrence he merely squirms, thrashes himself to one side, doubles up, whimpers, moans, or sighs. Illness usually becomes so distinctive that it too is of diagnostic value. The infant appears calm, too calm, pays little attention to his surroundings, and yet he seems preoccupied and apprehensive.

The blood in the stool often only in a second one brings about renewed interest. The sausage shaped tumor which is pathognomonic in this clinical setting may be found anywhere between the ileocecal valve and the rectum. It can nearly always be made out by palpation without an anesthetic if one has patience, gentleness and a warm hand. Tenderness is only slight. A rectal examination usually reveals it and may clinch the diagnosis.

Sudden and complete intestinal obstruction from any cause such as strangulated hernia, volvulus, paralytic ileus, congenital or acquired bands, or Meckel's diverticulum may present much the same pain and other signs and symptoms which occur in intussusception except that there is no blood coming from the rectum and no sausage-shaped tumor.

Chronic intestinal obstruction. The pain which occurs with chronic intestinal obstruction is due to congenital bands or narrowings due to tumors or postoperative adhesions and contractions and to other similar conditions may be negligible. On the other hand it may be fairly severe according to the nature, the rate of development and the degree of obstruction. It is always intermittent. It occurs with each new contraction of the intestine. The diagnosis must be based on the whole clinical picture.

Congestive *l* *a* *o* *r* *e* *c* *t* *a* *l* *s* *t* *r* *u* *e* *C* *o* *g* *e* *n* *i* *t* *l* *a* *n* *o* *r* *e* *c* *t* *a* *l* *s* *t* *r* *u* *e* *i* *s* *n* *a* *r* *a* *r* *e* *c* *o* *n* *d* *i* *t* *i* *o* *n* *The* *o* *b* *s* *t* *r* *u* *c* *t* *i* *o* *n* *i* *s* *d* *e* *t* *o* *a* *n* *i* *c* *o* *m* *p* *l* *e* *t* *e* *s* *u* *s* *o* *f* *t* *h* *e* *d* *e* *s* *c* *e* *n* *d* *e* *n* *t* *g* *m* *e* *n* *t* *r* *a* *n* *d* *t* *h* *e* *a* *s* *c* *e* *d* *e* *g* *p* *o* *c* *t* *o* *d* *e* *u* *m* *d* *u* *r* *i* *n* *g* *f* *o* *r* *m* *a* *r* *e* *s* *u* *l* *t* *i* *n* *g* *i* *n* *a* *d* *i* *a* *p* *h* *r* *a* *g* *m* *o* *r* *s* *i* *c* *k* *e* *s* *h* *a* *p* *e* *d* *p* *r* *o* *t* *r* *u* *s* *i* *o* *n* *f* *r* *o* *m* *t* *h* *e* *r* *e* *c* *t* *a* *l* *v* *a* *l* *l* *i* *e* *t* *h* *e* *l* *m* *e* *o* *f* *t* *h* *e* *i* *n* *t* *e* *s* *t* *i* *e* *t* *a* *t* *a* *p* *o* *i* *n* *t* *h* *e* *r* *e* *a* *r* *e* *l* *y* *m* *o* *r* *e* *t* *a* *n* *c* *i* *n* *t* *u* *m* *e* *t* *r* *a* *b* *o* *v* *e* *t* *h* *e* *s* *p* *h* *e* *r* *e* *a* *r*

Diagnosis is sometimes by one insertion model, then by inserting a larger finger each time over a period of days, results in cure.

Obstruction of the renal and gall
 ducts is never accompanied in a child
 by urethral stricture rarely leads to much
 sharp pain may however occur with acute
 stricture of the vesical neck obstruction leads
 to hypertrophy and dilatation of the bladder
 ureters and kidneys. Children will sometimes permit
 the bladder to become distended to a painful degree
 without a knowledge of either a local or a general
 lesion. A little encouragement at a stricture
 some running water let into a bedridden girl's
 or a boy's stand will rarely by its obviating the neces-
 sity of catheterization

Appendix 1: Because an early diagnosis is vital for the exclusion or establishment of the diagnosis

GYNECOLOGY

UTERUS

T Lind R W The Surgical Treatment of Prolapsed Uterus J Am Med 1945 127 49

In the group of relatively young women suffering from a second-degree prolapse who do not desire more children the author finds the Spalding Richardson composite operation of special value. The technique of this as yet little known operation is described. In addition to giving very satisfactory support to automatically situated uterus the procedure relieves the patient from bearing down the extensive plastic work. The author definitely objects to the Watkins transposition operation, this group of young women too many years ahead in health to propose uterus may develop benign or malignant disease and when this occurs the uterus can be removed only with difficulty.

The largest group of women who present themselves with uterine prolapse and vaginal relaxation so that they are fifty years of age. He gives only first-degree prolapse present the Vaginal operation serves well in the cases in which the uterus is healthy. Where second or third-degree prolapse exists the patient is a good operative candidate he prefers the Spalding Richardson procedure. This operation however is rather prolonged and should not be done if the physical condition of the patient is such that a tentative operation would be ill advised. In these cases the Watkins transposition operation is quite satisfactory provided the uterus is healthy and of the proper size. It is specially satisfactory when the cystocele is young and the tension in the large bladder is not too great. It is effective in relieving the penning through the bladder herniated. The fact that the uterine myometrium is still strong in future cases is most helpful in deciding against but when the cervix is much distended the possibility of great distention of the uterus is compensated for by the strength of the peritoneal and mesometrial ligaments peritoneal contraction is indicated.

When prolapse is all else considered is associated with benign uterine disease such as small fibroids or functional bleeding gynecological hysterectomy in most cases the peritoneal ligaments are not involved. However in the small fibroid is as far as the distended bladder is concerned the term is not applicable. The operation is performed by the Spalding Richardson procedure.

In cases with gross trapped cervix hysterectomy of ovaries and tumors is a necessary procedure. In such cases the hysterectomy is performed by the plastic operation and the uterus is removed by abdominal surgery.

When second or third-degree descent of the uterus is in the line of the uterus is not preferred. The operation is performed by the Spalding Richardson procedure.

gery the LeFort colpocleisis is quite satisfactory if the patient has no further interest in sexual relations. If the patient desires to remain fertile a vaginal life a fairly satisfactory function of vagina can be preserved by performing a partial colpocleisis and perineal repair described by Codd II and Poirers. EDWARD L. COLEMAN

Aubach S H and Pund E R Squamous Metaplasia of the Cervix Uteri J Obst 1945 49 7

In order to observe the incidence of squamous metaplasia and find some etiological factors data have been recorded on a series of more than 600 cervixes fixed for the past few years. The cervixes were fixed in toto and sectioned serially and the external os at intervals of from 2 to 3 mm.

Squamous metaplasia as compared to 72 of 100 cervixes in amniotomes varying from minimal (+) to maximal (4+) the latter representing almost complete transformation of the columnar epithelium of the cervical canal. Racemous areas have no effect on the evidence. The youngest patient in the series was twenty-one and the oldest fifty-one year. The cervix was normal as far as evidence from the third through the fifth decades and the evidence was emphasized by a considerable increase in the number of the cervix was abnormal at birth and the presence of metaplastic epithelium. Metaplastic disorders are noncontagious. Gross abnormal fixation of the cervix was made on the fresh specimen and they refused to be without effect as factors. The evidence suggests a relationship between chronic inflammation and the occurrence of metaplastic epithelium. The cervixes were observed together in 30 states while inflammation without metaplasia as seen in 9 cases. The latter cases included some instances of morbid changes usually with ulceration so that the metaplasia probably developed at a high level. Metaplasia without inflammation was observed in 42 cases. In active cases metaplasia occurred in the cervix. In both cases there was metaplasia in addition to the functional neoplasia but the processes are entirely distinct. The cancer cells treat the metaplastic epithelium with the same disregard shown the normal columnar epithelium uprooting and displacing it from beneath.

It is the authors opinion that chronic inflammation plays a major part in the process that the figure is and that the high incidence of metaplasia is a vagary.

It was not uncommon to find isolated patches of metaplastic squamous epithelium composed by local and cell infiltration while the surrounding area was almost entirely functional.

Whatever the etiology a definite significance of the metaplastic epithelium it seems to bear no relation to

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ADNEXAL AND PERIUTERINE CONDITIONS

Gallucci J W lffian tum r (T m lff)
Rev bt g S P I 945 7

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EXTERNAL GENITALIA

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f fant and Child en ll J S g 945 53 55

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A E G M o o \ M D

The authors consider toxemia of pregnancy to be a temporary disorder closely associated with pregnancy and leaving of itself no permanent lesions. There is therefore no justification for term at cesarean to emic pregnancy prematurely in order to protect the mother from chronic hypertension. Also since there is no evidence in this article to indicate that pregnancy permanently aggravates hypertension, delaying when pregnancy starts there is no justification for termination of an early pregnancy in a patient who has essential hypertension.

HARR FIELDS MD

Spel M D W le G Th m s E W nd
A I I I A The Rapid Termination of Early
Syll Ills during Pregnancy *Am J Obst* 945
49 2 4

Forty-three pregnant patients were treated for syphilis with massive mapharsen therapy. One death from cerebral encephalopathy occurred in the group. Of the 32 patients with early infectious syphilis, 13 completed treatment and 19 were kept under observation. 13 of 16 patients with 76.6 per cent positive results from the Wassermann test. If the babies not proved to be syphilitic are eliminated from the calculations, the probable good results would be 85 per cent.

At the prenatal syphilis clinic of the Bellevue Hospital, New York, thirty-five pregnant patients treated for early infectious syphilis with mapharsen therapy between 1936 and 1944. Part of the adjuvant therapy consisted of penicillin therapy. Of the 35 patients, 5 patients de-veloped late and pregnant de-veloped flat venereal dermatitis. Only 5 per cent of the offspring were from syphilis.

In the relatively small series reported here, ten of the 35 patients died and more effective than the treatment. Nevertheless, the remains the false cerebral encephalopathy, a death is probably due to the treatment. Mapharsen therapy when the same drug is employed, the treatment of the disease.

Massive mapharsen therapy, the treatment of early infectious syphilis, the results of pregnancy have been excellent. Its success has been fully demonstrated in 32 patients treated. The results of the treatment in the who had a cutaneous relapse.

E RD L C NEILL, MD

Ric P M Neisse in infection in pregnancy
Am J Obst 945 49 6

Fifty bacterial patients have been examined by smears, cultures, and the tepa method, trapa method and postpartum periods, and the results of the culture and identification. Forty-four bacterial infections were found in the labor with the following suggestions: 1. A fetal death or postpartum infection. 2. The culture results have been compared with the negative postpartum demonstration of certain features relating to diagnosis of true infection. The treatment of infection in pregnancy. Culture

is more efficient than smear in establishing a positive diagnosis in a suspected infection in pregnancy.

Smear is valuable in conjunction with culture in establishing a positive diagnosis in chronic infections and particularly in following up treated patients for cure. Repeat smear and culture at the time of a search of physical examination is the most adequate method of diagnosis. One negative smear and culture will not rule out gonorrhea.

Neisseria catarrhalis was isolated from 4 per cent of the patients. In the interest of an accurate diagnosis and for the protection of both the patient and physician, fermentation studies should be done to identify the particular neisseria present.

The gonococcus was apparently activated by the trauma of labor and was recovered from the urethra postpartum in 2 treated patients who had negative cultures before labor. The gonococcus was recovered from the urethra of 8 postpartum patients not previously examined or treated. The gonococcus was not recovered from the show or lochia of patients proved to harbor the infection in the urethra or cervix.

Two patients with acute gonorrhea and 2 with cured infections had caly postpartum morbidity with clinical endometritis.

Gonorrheal infection appeared more persistent and resistant to treatment in pregnancy.

Diagnosis by smear seemed more confusing in the pregnant than in the nonpregnant male.

Forty-four of the 5 patients with positive cultures were treated and 38 were found to be negative after the first course of sulfonamide treatment. Six remained positive after the first course and received subsequent treatment. EDWARD L CORNELL MD

If nsen J L Acute Anterior Poliomyelitis during Pregnancy *Acta Obst G* 1943 3 4

Anterior poliomyelitis rarely occurs during pregnancy. The author reports what he believes is the first case observed in the Scandinavian countries. The patient was a woman of twenty-five who had previously been well. She contracted a tetanospasmodic infection five weeks before delivery. Her second pregnancy. There was no paralysis of the muscles of the trunk, the abdominal muscles, and the urinary bladder. The pregnancy continued normally. As there were no labor pains eight hours after the discharge of the amniotic fluid, she was given vitamin B and delivery was terminated by cesarean section. The child was normal. During the first week of the puerperium there was marked improvement in the paralysis, but after that its course was about as usual.

This is the twentieth case of a tetanospasmodic infection during pregnancy reported in the literature. Ten of the cases occurred in the United States, 6 in Germany, 2 in France, and 1 in each of Czechoslovakia and Denmark. A table showing the essential features of the cases is given.

The disease may occur at any time during pregnancy and its course is apt to be more severe than

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be ov rcom by med cal t eatm t the baby will sur
viv even tho gh th anatom cal f ctor ma as

Vomiti g s us ally the pr d min t symptom
ny fo m of duod nal obstruct n it s generally
f reible occurri g immediately fter c h f e d g
nd often the vomitu s hile tained This last g
s of gre tval e nd aenosis An ext sus ally pro
n unced and if the b y is t f o ced t take mo
th n it want the tak s s sm ll th t d ste tion
nd the onset of om tng may h delayed Const p
tion may b seve e but the stool show n vide ce
f digesti e upset Wast ga d d hydrate vary n
d gree acco dng to the se eity f the case Vis hie
peri talk s of the stomach may be se e but is of
mark d n pyl c t no s Fail e t find th
firm pylori tumor s an imp rta t p nt in d f
nt at on from the l tte co d t n Th g er l
e mi at n of th b by sh uld nclud a s arch fo
nfection d cer bral ca s fo th vomit g
\ rays may show flu d le ls in the st m ch d
du denum with d st ntion of the latt r

T o illu trat e ca s are d sc bod e pat t
s treated med cally and surviv d but th othe
d ed fr m olvul s d sp te t e time t

J R ERT WILSON M D

MISCELLANEOUS

Har is n C V and M a ock E C Th V l of
th Rh sus T sel n Ob t trics J Ob t Gy B i
Emp 945 5 36

The uth rs revl w the statu of the Rh test in
bst trics studyi g the Rh r ctns of S cl ct d
ob t tri al cases

They ag e in their fi di g with th rwo l krs as
f a hyd ops fetalis icterus gravis d h m lytic
m a ar co c rn d H w r th y gree th
H nders n and J t that th r s a f n th variant
f h m lytic d s as f th n wborn This is d a
no d by f ll ng Rh t body t ter fr bout th
tw nt eth we k t s ggest d th t this s d e t s
a o p t n by the fet s Th s s l s m f tal de th
mac rat and gus of damag to the l yver with
fibrosis An cessi rythr po esis cannot usually
b dem nstrated

The auth s have n t found v de ce m th sst dy
to ugge t th t the is any c n ect on b tween th
Rh fact r d rep ted abo tons co g n t lah
mal ties h m r h g d sease f the n wborn d
t m as f pregnancy al rep ated till rths nd
n o atal de ths the tha th du t the fo
variants of hemolytic d sease f the n wborn

HARR FIELDS M D

Torpin R Th I ff enc f th Pl central Sit
F t l Present ti n J Im M 4 945 7 44

This port c vers a series f 500 films sh w the
location of the placenta w th s relat n t f t l
presentation The ce hu d ed a d s i tv thre film
ere re e ed d reported in a pre ous t cl

Occ p topo t n r pres ntat m y be class ned
into 3 categori (a) prim ry occ pitoposte i p
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tation t a terop t nor pre tat o (h) occ p to
post p es tat n th rot t th the tra s
verse po t n d rrest of th fet a d (c) occ p
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te t d l ery

The etiol y of these 3 type f pres tat on d
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D E po re d that there as a d t nct i
tation n the part f the f t l h d to g th t
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eter f the let l p les ith lo a te po t e
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the head to ea ether an cept a to r
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Th i ciden e gre tly th d f re t
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M th m at cally the f ll i g c cl s w
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a t nior presentation was early t ice as great as when the placenta located ante o lv—59 to 33.6 p cent. The incidence of cephalic presentation was 26.5 p cent if the placenta was located on the posterior wall and 33.1 p cent if it was found to be on the anterior.

CATHERINE B. HESS, M.D.

Hamburg, G. Contribution to the histology of the placenta in the case of placental epithelioma. *Bd. n. 76* Cases with histological analysis. *Acta obstet. gynec. scand.* 1943, 4, 45.

Soon after the development of the Aschheim-Zondek test for pregnancy and Friedman's modification of it it was found that placental chorioepithelioma could be brought about with much smaller amounts of urine in cases of hydatidiform mole and chorionic epithelioma than in cases of normal pregnancy. This suggested the possibility of histological diagnosis of hydatidiform mole and chorionic epithelioma. The author investigated this question on material from the Hormel Dispensary of the Stat Serum Institute of Copenhagen. During 76 cases of hydatidiform mole and chorionic epithelioma and 71 cases of normal pregnancy in which no such complications were found.

Histological examination determined the extent of chorionic gonadotropin excretion in the urine; the diagnosis of hydatidiform mole as it is impossible to establish the upper limit of normal values. Nineteen out of one million maternal units of gonadotropin per liter of blood finally proved the presence of hydatidiform mole. However, the gonadotropin excretion has been valuable in the maternal examination of about 6 per cent of the patients with multiple pregnancies showing gonadotropin excretion of 300,000 or more international units per liter while 8 per cent of the twinning moles excreted more than 100,000.

In uncomplicated cases of mole the gonadotropin falls off rapidly and after a month is rarely more than 30,000 international units. If high excretion is found for this time it is a case of placental or chorionic epithelioma. In the latter the gonadotropin continues to rise and the histological examination of the placenta remains positive.

In the 3 complicated cases of this material there was a protracted gonadotropin excretion which showed a tendency to rise rather than to disappear after the first month and there was an excretion of 3,000 international units more a month after removal of the mole. Periodic determinations of gonadotropin excretion should be made at least six months after removal of the mole. If microscopic examination of the mole causes suspicion of chorionic epithelioma the control examinations should be made at intervals of one or two weeks.

AUDREY G. MORGAN, M.D.

Strauss, R. and De No, J. N. Effects of an Abortion Client Paste (Ultra-J) on the Post-Death of the Uterus and of an Experimental Study of Its Effects on Rabbits and Rats. *Arch. Path. Ch.* 1945, 39, 9.

The death of a young woman due to an abortion client paste and the medicolegal angle involved stimulated the experimental studies described in this article.

The paste or jelly is a whole and its component active elements introduced in laboratory animals and mixed with the human blood and the effects are described principally from a histopathological standpoint.

When mixed with human blood the cellular structure of the blood becomes lumpy and a immediate color change is observed. The prepared coagulum after fixing staining and cutting histologically presented a complete loss of cellular elements being replaced by amorphous degenerated masses.

The introduction of the material into the uterus of a pregnant rabbit produced death within a week. On examination the uterine cavity was found to be empty and a perforation was found at the site of application of the paste. Section of tissues microscopically studied revealed an extensive necrotizing inflammatory process.

In animals which survived no marked evidence of damage was found. The uterine wall in the injected sites revealed an inflammatory infiltration of the wall of the horn.

The paste had a distinct caustic effect and produced teratogenic effects and the effects had taken place in the cases reported. K. A. BECK, M.D.

factory Postoperative high voltage x-ray therapy was employed in those cases in which the tumor was found to be malignant. Radical excision of abdominal lymph nodes was not performed. Exploratory operations when there is a reasonable suspicion of testicular tumor are not recommended because of the likelihood of spread of the tumor.

Of the 5 patients having malignant testicular tumors, 36% were alive without evidence of metastasis, 6 are living with metastases, and 11 are dead. Of those living without metastases, 16 have been well from 1 year to twenty-five months following operation. The likelihood of metastasis in this series must be attributed to early diagnosis and treatment.

WILLIAM W. SCOTT, M.D.

MISCELLANEOUS

Hundley J. M. Jr. and Diehl W. K. The Influence of Gynecologic Disorders on the Urinary System. *J. A. M. A.* 1945, 7: 57.

One of the most important factors in the production of urinary tract changes due to pressure exerted by pathological processes is the female pelvis. This is a thorough and brief summary of previous findings on the physiological and pathological changes in the urinary tract during pregnancy and also have shown what effects estrogen and progesterone exert on the urinary tract.

The second factor discussed was the pathology of the urinary tract as a result of parturition. Here were considered relations of the pelvic floor with special reference to the cystocele and the frequently associated cystitis. It was also shown that the pelvis may be a logical site for the production of infection of the urinary tract. A method for the repair of vaginal fistulas was discussed.

which the surrounding vaginal mucosa is used to correct the defect. Stress incontinence is of frequent occurrence. It is in the postoperative usual women with regressive changes occurring in the bladder and trigone because of absence of stress. Gynecological treatment is frequently associated with the regressive changes and usually alleviated by the topical application of silver nitrate solution (1 in 2 to 3 percent) through the Kelly cystoscope. Stress incontinence is also seen as a result of obstetric trauma when the associated retention of urine and stretching of the fascial supports. The operation described by Howard A. Kelly is of distinct value and its success is dependent upon the proper stressing of the vesicourethral neck. Fistulas are of frequent occurrence in the greatest number resulting from operative treatment and from irradiation of cervical carcinoma. Vesicovaginal fistulas due to childbirth have been rarely seen by the authors.

The thoracic extension of the pelvic fistulae, they find in the urinary system. The significant fact that the incidence of this condition is rather high in many cases causes pressure on the thoracic lymphatic system. A procedure is suggested for the treatment of the thoracic extension of the fistula. The work of Schreiber is utilized in the treatment of the thoracic extension of the fistula. The etiological factors in its production are in relation to the term "thoracic cervical fistula" played in the production of bladder disease. The thoracic extension of the fistula varies in degree of involvement of the major thoracic lymphatic system. Cystoscopy was carried out during the examination of the data that the thoracic extension of the fistula that does not play a major part in the production of bladder infection. If lymphatic migration to the thoracic lymphatic system occurs, why does it occur? The authors note that the thoracic extension of the fistula is more frequently

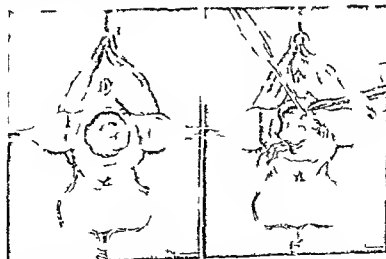


Fig. Left. Vaginal fistula in prone position. Fig. Right. Uterine flap repair of vaginal fistula noted by ambricau sutures.

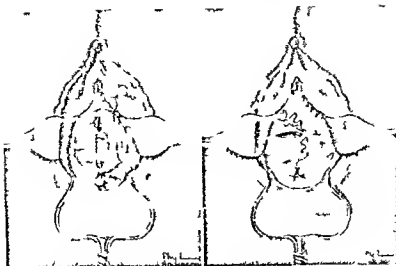


Fig. 3 Left Cervix of normal uterus. Fig. 4 Right Cervix of uterus with leiomyoma.

th bladder? Cysto copy of 43 patients with carcinoma of the cervix did not show involvement in 54 incidence of 3 per cent.

Anit st g i vasive les f th hla ller from gynecol g e focus was reviewed mely e d me t i o s s Th i s o s of commo occu c a d hen h mat a curs at the tim of menst t d gn can h r adly made The devel p t nd m int a c f th s ect p e c d metrium d pendent n act ty Whe th r e s d s p e d i vol em t f the ntestin ct vagi l s pt m o h l d d ph rect my may be the i o ced u of ch c a t l l a o d a d f f l a d f n ha do s p t Curs B M D

W t t n b r g C A d R D K Side Effect Cau d by Di thyl til be t l nd Corr l ted with Cance of th l tat Gl nd J t t B l t 945 53 35

D r g th p t f w years e p e m e t s conc n g th n f e c e f t o g e n i c h o r m o n e s o v a i o m l a i m a l s h a e r v e a l d s o m e i n t e s t i g h i s t l o g c a l c h n g e s

In th thors study a s e c t m d f m th r th a l m c o a h f o r e a y t e m t t h d thyl st l b e s t r l w s g v n The b p y s p e m as tak n f r o m a m l v e n t y y a s o f a g e w l h a d c a r c m o f th p r s t t g l d Th m u e s a w a s n l y l e w c e l l s t h c k s a d h d t h n h m t m m b r a n e

Th b s t c h g e s d u t d e t h y l t l b e s t r l d r g the treatme t o f c a c of the p state gland e t l y h a h n r p o t e d b y N l e m c o l l b o t n w th th auth l th s study t w f o d th t a f t e r the pat n t h d b e t t d t h d thyl t l b e s t o l t h b r e a t g o s l y b e m l a g d a l f t p a f l Th t s s u m d l r m th b t b

fore treatm nt ith diethylstilbestrol shows a small amount of interstitial tissue an occas o a l d c t n th th n f i b u s t r o m a a f e w s m a l l b l o o d v e s l s Th e p i t h l a l c e l l s a r e f o r the m o s t p a t o f a s n g l e l a y e No d e f i n i t e a c i n i a r e s e n

As the patient as treated w th diethylstilbestrol p r d c s e c t k n which showed a p o g r e s s p r l f t i o n of the duct e p t h e l i u m The l l o f t h d c t s i n c r e a s e d i t h r t h i c k e s s the ducts becam e l o a t e d a d h d d v a s p s e t There was c n s i d e r a b l e e d e m of a l l the t i s s u e s a n d a i n c r e a s e t h c o n c t i v t i s s e w i t h a n c e a s e a s c u l a r t y The duct cells f t n w e r e m u l t i p l d t o s c h a n t n t a s t o c c l u d t h l u m n

Th d m a w h i c h f i t e o c c u r s d g t h e g n g o f a e s t o g n i s a t r o u b l o m e s d f f e c t d n g t h t t m e n t f o c a r c o m a o f the p o t a t g l n d v r y f t n d m o f t h l o r e x t r e m i t i e s o c c u r s f i r s t a d c a n b e i t h e r u n i l a t a l o r b i l a t r a l I t a l s o e n c u r t h e c r o t u m a d p n i s I p a t n t s m e s i d d e v l p d i n the p t o n e a l v i t y a n d d i s a p p e a r d w h e the e s t r g n w a s s t p p e d W h n t h e d e m o c c u r s the p a t i t o f t e s t o p t a k g d t h y l t l b e s t r l m p l t y o r t h d o s a g h a s t b e r e d u c e e t h g h i t o l o g h a s the m x m u m t h e r a p u t e f f t Th a u t h o r s h a v e h d s m e p a t i e t y i n w h o m a k l e d m a d e v e l p d h i l e t h e y e c v d l y 35 m g m f d e t h y l s t l b e s t l e y t h e r d y w h i o t h r s d d o t h a v e i t w h i l t a k i n g 5 m g m a d y Th r l o e t h p e s e c e f e d m a t h a b s e c o f e d e m i s n o i d e t t h e b e f t t h e p a t i e t s r e c e n g f o m t h t r t m n t o f the p r o s t a t e c a n r

A o t h e s i d e e f f t i s m a d e s t i the t e s The t e s t s c r e t a n a d o g n i c h o r m o n e W h n d e t h y l t l b e s t o l a e s t r o g e n i s g i v n t a p a t t i t t h o u g h t t h a t t h e t r a l z e s t h a d r g n s b s t c

Th s in turn reduces the st mulat on to the pr stat c
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mat oa and spermatog eus is complete

Th basement m mb a e can h m th cl n d
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✓ seminiferous tubules Ar t f p m t g
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Jour A L MD

Bell H J G norriea In fr fy J R A my M Corps
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J n A L MD

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S tuf ky E M Ma gement of Ch ncr l d f
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Am M t 945 7 59

Ch n c d an acute flammatory lestru ct
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Th port d l th 555 pat ts in h m the
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b tion per d w s from thee to ten days after se ual e posu The initial l on was a sm ll r d mac le h h b came papula pu tular and fin lly sulcerat v Multiple l ons ere ab ut f r time as c mmo as s gle lesions Only 62 of the cases wer in c l d old ers Clin cally the les o s ere ragged irre ular sl lity ndu ated ulc rs co ered with a yell g ay purulent pellicle hich could be w ped away r valing a n c tic gra ular base wh ch ble eas ly A redd ned inflammatory ar la w s usu lly p se t The ul rs sp ead by tens n a d c al see c d w bs rved to b inoculabl and a t in culabl Ingu al lymphadenopathy was observed in 56 per ce t of the cases Usually the nod s we c frm elast c and movable b t in som cas s they er m tted t ether and fluetuant The diag s s f ha c o l made on el ical grou ds alo after l b rato y tests for syphil s (d l feld) and lymph a l ma (Fr i k n test) were fo nd gative Cult r s and mrunolog cal and d f e t l st n t ch que e not empl yed for diag nosis

Tre tme t con tel of local r system c and local Im nistrat n f sulf mides Wheng ve locally th lesion s ele nced with s ap and w ter twee daly du t d th po dered s lfa lam de and bandage l loo ely until the lesion healed In patients

with phimo s and l lly g ulcerati e lesions irri g t s e e give t iced ily with r to 5 000 potas um p manga at s lut After adequate trial f the apy st as n ces ry to make a d rsal sl t in 6 p tients with vere l l m which int rf red ith dra age a d th apy When suppurat ve m al glands were present they w re aspir ated th ough a st rle ca ul a d inj ct d with from r o t 15 ml of 7 per cent t ctu of iod n and ba daged tght ly In f m five to seven days the area s healed with ut seq lae

Oral system c therapy consisted of sulf th azole gm four t mes daly fo fve days followed by 5 gm f ur times daly for ten days Sulfan lam ie was also used as as sulfad z ne but the best re lts and f wer toxic reactions were obtained ith sulf th azole All lesions h aled without surgical intervent n a d p tie ts were d scharged to full duty when the lesions were completely p thel zel The verag hosp tal zation pe to l was eleven and two-tenths days From three to fve d y after dis ch rge from the h spital 55 pat e ts develop d currence of th r pe ie lesions In 18 f these d l field e am ations w e pos tive The r mai n case f chaner d responded sat fact rly to fu ther local and system c sulfo amide th apy

DON LD F McDONALD M D

SURGERY OF THE BONES JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES JOINTS MUSCLES TENDONS ETC

Coope C E Epi ndylitis f the H m ru U S
V M Bull 945 44 5

Epi condylitis is a painful p riste t ffect on of the perio tum a d t nd no t tachment f the xte nal late al o inter al (m d a) bum l ep condyl Its pathogenes s obse and th c nditi n tends to e e tual rec ery The c d ton affects th xte n l p condyl t n o t l e times a fr que tly as it does the i t rnal Th r a o f this may b that the e ter l e p c o dyl s m o of n expo ed to i j r th s the t a l o e In a ry f w sta ces both co dyles m y be affected multa co sly us lly foll w ng a cru h g in j ry T o cases ill st i g the typ cal d ngs n e t l e p c o dyl tis are p e s e n t d

Th t w m st characterist gn f e t al p co dyl tis re te de ss ov r th e te a f e p con dyle and p i on d r s i t i o n f th w i s t ag s t r s i t a n c e

The two cha acte i t c s g o f t e l e p i c o n d y l t r e t n d e s s v e r the m d l e p n d y l a d p n o p l m a i l i n o f the w r i s t a g a n t r e s i t a c e Treatment is carried o t h i l e th p t e n t co t i u e s h s w o r k Y y th r a p y i p r o b a b l y the t e m t o f ch c e w th o p e t o r e s e r v e d f o r th t a n t c a s e s

N y th r a p y d m i s t e r d i f o u r d o s e s o f a b t s r o e t g e s e a c h t f o u r d a y i t e a l e s s e t t i a f a f y h i p c t a g f c a s e s f l o w v e r t s s o m t i m e s f o l l o e d b y a t e m p o r a r y t e s i c a t f t h e j m p t m s a d i s e f f e c t c a n o b p p e c a t d u t i l s e v r a l e e k s h a e p a s s e d I o o f the c a s e s r e p o r t d h r e i t a s e d w i t h e c e l l e n t r e s i t s t i s r b r d a s t h t a t m n t o f h o c e

O p e t o c i t s i f c a r e f l s e c h f o r a r a d i o h u m e r a l b r s a a t h t o m y o f t h a d h m e l j n t t h m v l o f t h h y p e r t r o p h i d s y n o v i l f g e i f p r e s t a d i t p p n g o f t h e d n f m t h p o d l e w h i c h t h e n c a u t z e d N o t t e m p t m a d e t o u t t h e t n d b c k n p l The o d s c l e d a n d t h l b o i d e s e d t h a m p r e s s o d e s g

R B P M o t c M E R Y M D

W n H S Cal f i c a t i n f t h I n t r v t b r a l D i c s i n C h i l d h o o J P d f S L w 945 6 78

Th t l o g c l f t o r s d e f c a l i f i c a f c a l c i f c t n o f i t r v e t e b r l d e s n a d u l t s h e b n t h b y e c t o t r o r s v I n t e r v t b a l d e s c o n s i s t f t h r e e p t s t h n c l u p l p o a l f i b r o u s d e c a t i l a g p l a t e s C a l c i f c a t o n o f i n t e b l d e s a d l t s m a y c a s e a g u c o m p l a t s o r m a y o c r w i t h c o m p l t e a b s e c e o f c l c a l s y m p t o m s

Th a t h r r p r t d t h c a s e o f a f i v e y o l d g i l b d e l p d a s u d d a t t a c k o f r e p i m t h e b c k o f t h l a s c a t e d i t h h p e r e x n f t h e c r v i c a l p k p h o s o f t h e t h o a c c p a d m a r k e d l i m i t u i f m t i o n f t h e h e d n d e c k The a c u t e e p s d a s p e c e e d e d b y l i g t c h g t h e b c k o f t h c k f o t w o m t h Th p e s b s t r y c e l d f r q u e n t t a c k s f t l l u o t i s m d a d s c a r i S l i g h t f r a l l e u c y t o s i w t h i p h l a w e e t e d T h e x r a x a m t i o a l e d d e c a l c i f c a t l i g t h d e u p l o s u s d t h a n t r p o r t n f t h a n f s i b o s f t h e s t h c e r v i c a l d e T h i c f c a t h d h p e s t f o a t l a s t s e v e n m t h a s d e m s t r a t d a p u s c h e s t r e n i g g r a m W t h o t t r e a t m t c o m p l t e c o r y f o l l d i t h i t e l e d a v N r a y a m n t a f t e t h i t v l r e l e d t k g d c r e e t h e s e o f t h c a l c i f c a t i o h h e m a d e s a m n t e d e p o s t t h e n f t h a n f i b s u A m a t a f t e f u m o n t h s s h o d c o m p l e t e d a p p e a c e f t h e c a l c i f c a t o

F a d d o l s t a c s f e l f i c a t i o f i t e t e b l d e s v o l t h e n l p u l p o s i c h i l d r e v e d f o m t h e i t r a t e A l l e a s w r e c h a c t e d b y a n e u t e p o d f p i t h r e g o n f t h i o l e d g m n t f t h s p i l m t i n o f m t o a d s p i l d e f m e y A s t d i f t h e s e c a s e s g g e s t c a d d i f f e e s b t c a l c i f c a t i o n o f i t r t e b l d e s i h l d h o d a d i a d l i f e

I t m e t o f t h e c r v i c l p a n t l i 4 f 6 c a s e s o f c a l c i f c a t o n o f n t r v e t h l d e s o c c u r i n g n c h i l d h o o C l c i f c a t f t h l p l o s u s n a d l i l i l c l z e d p e d m t l y t h e t h o a c i d i m b t b

2 R a p i d c h g i t h s i z e o f c a l f e a t c c o m p l e t e b r p t a n t e d i 5 f t h e 6 c h i l d C a l c i f c a t i n f t h e n c l p l p d u l t l f i a s r u l a t a t r y p t c s

3 S t i k g c l c a l s y m p t m w t d t h c a s e s d e s c r i b e d c h i l d h o o w h r e a s t h e c d t s p b l y o f l i t t l e c l n c a l g f i c a c e i a d l i f e Th d e m o t t o f a b l l p p l y t o t h i t r r t b a l d e s h i l d i l u g g e s t t h t a l c f t o m a y b e t h r e s i t f a m t a s t c f c t p r e s i l g t h e d e s

E t F A m M D

SURGERY OF THE BONES JOINTS MUSCLES TENDONS ETC

H m n O J Th M M r a y O t t m y f r N a u n i t d H p F r a t s V f p l d J W 945 3 86

Th M c M r y o s t i m a b i c t p e r t b e d t h s u g g e s t f L o w h h t h s h a f t f t h f m s t f r e d d t l y d r t h e

l er m g u f t h a c t a l l u m a n l h e a l f t h e
f e m r . T h e c h i f f u j o s e f t h o f t u i t
c h a n g e l i n g f r e s t o a l r c t o

S e e t h e p u b l i c a t i o n o f a j e r r i t i
S p t m b r 1911 m e s u c h r e c n t u c t i o n h a e
b n d o n e a t t h b o s t n C y l l p t l b y v a r i s
s r g s . T w o m o d i f i c a t i o n s i n t h e t e c h n i q u e v e e
d d e d . F i r s t t p l a c t h o s t t m y l m o r e a c
a c t u a l l y a K i s c h n e i e s i s e t e d i n t h e p r o p o s e d
s t t m y l a n d i t s p o s i t i o n i s c h e c k e d b y x r a y s
t h e w i e t h n b g u s d o s a g u i d e i n d o i g t h e
a c t u a l o t e t m y . S e c o d i n s e v e r a l c a s e s t h e
B l o u t b l a d e p l a t e h a s b e e n u s e d a s a m e a n s o f
i t r a l f i x a t o n a f t e r t h e o s t t m y h a s b n d
T h e f i r s t m l i c a t i o n s e d t o p l a c e t h e o s t e o t o m
m u c h m o c c e t l y t h a n t h e o d n g t o u c h
m e t h o d a n d t h e e c o n l a s a d f i t m p r v e m t
t h a t i t a s p u s b l e t o d a y t b t b p o l g e d
p l t r f l i s p e a f t i o n a n d b e d c o n f i n e m e n t
a n d i t a l s o p e n t e d t h e c u t e n d o f t h e d i l
f m o a l s h a f t f r m l p p g o r s l d g t

F o f t h e 8 c a s e s r e p t e d i 94 h e b e e n e
m i e d I a l l f t h e m t h e 1911 e n d e u l t s h a d
b e e n d e e m e d s u c c e s s f u l . T w o p a t i e n t s h a v e d e
l o p e d c o n s i d e r a b l e p a i n h a v l o s t s m e o f t h e r
l o c a l r a g e o f h p m t o n a n d h o w n n e r e s i n
s h o r t e g b c a u s e f s m e c h a n g e i n p o s i t i o n o f t h e
d i s t a l f e m o a l s h a f t d e t l a c k o f t r u e b o n y u n i o n
T h u s t h e 1911 r a t i n g o f t h e M c M u r r a y o s t o t m y
h a s h a d t o b e c e d d o w n w a r d .

O f t h e l a s t 11 p a t i e n t s t r a t d d d s a f t
t h o p e r a t i o n o n e o f t h m t h e e d s f t r w d f o m
c e b r a l t h r o m b o s a d t h e o t h e w i t h i n t w e n t y
f h o u r s f r o m c a r d a c f l e .

T h o s e w h o c m t a g o d c l i n i c l e n d e s u l t f l
l g t h s m t h o d (n e c a n e p e c t a b u t 80 p e r
c e t t o d s) w l k t h a s l i g h t i m p b e c a u c f t h e
r e s u l t a n t s h o r t g f f o m 2 t o 3 c m . T h y d
t h e r d a i l y a m o u t f r i e c a l k g a n d g u p a d
d n s t a r w t h u t p a n b t w i t h a c a e . S o m e h v e
m d a t e p a n t h e d o f d a y a f t r a e t r a l g
w l k . T h e y c a n s t a d l w i t h c o m f r t a l t h g h
m e c a e t h e r e s a f l i g o f l a c l s t i f f s s

g e t t g p f t e r a p r t r a t d i s t i t u t i o n w h h w v r
p a s s e s f l n m o v i n g a b t . A s a r u l e t h y c a p t
n t h e r s h o e a d t o c k g t h f l e c t d i g h c a u s e s
t h e y c a n f i x t h h i p c o t h k e e a n d a d d u c t a d
e t n l l y r o t a t t h l g l t i t r u e t h a t t h e c r o s s g
f t h l e g s i s f t e d c w i t h s m e d i c u l t y b u t
t h e s p i n . T h p a t i e n t s c a n h t h e m e l e s
t h r l g s q i t w e l l b e c o e o f t h p s e c e o f a n
a b d e t i n a r g g b e t n s a d 35 d e g r e e
f o m a l c a l a t m c t a d p o t t h e p e c t u r s t
c o u r a g e n d a l l t h t a b d i t h a t t h
f o m h e a r g o c e o f t h f m r h b n t a n s
p o s e d i t a d r t f c e t h t e l m t s p i n d
g s f l e c t i t b l i t y n d m b l i t y a t t h h p j t
t e n b l e t h e p a t t t o g b o u t g o o d d g r f
f u i g c o m f t i t h t h d o f a c a n

T h e e l e a s i n w h c h t h B l o u n t b l a d p l a t
n t r l f a t a s e d f l l o w g t h e o s t t m
f m h d a d d t l d a t a . T h t e c h n i c a l p t o f t h

f t i c u l d b e m d e m c h s i m p l r a n l t h e p l a t
m a d t c e f f m m t e a c c u a t e r t o t h a n g u l r
h j e n c l i f a t o p i e c e c o m l t n h a s t h e
T h r t n p l a t e t g e t h e r v t h t h S m t h l e t e r s
n i l v a s i e d . T h s f i x a t o n d o e s a w v t h p o t
o p e r a t i v e f i c a f i a t i o n a d t h e r e b y a l l v s m c h
l i e r m h i l i t y f t h v a r i o u s j o i n t s i n v o l v e d t h e
s p c a f i x a t i o n a n d o f c o u r s e m u c h e a r l i e r a p p l c a
t i n o f l o c a l p h y s c a l t h e r a p y . I t s h o r t e n s t h e p e i d
o f c o n f i n e m e n t t o b e d b y f r o m f i v e t o e l e v e n w e k s
T h e f a l a d a t a g o f t h i s f i x a t o n t h a t i t p
v e n t t h e s l i p p i n g o s l i d i n g o f t h e t r a n s p o s e d
f m o r a l s h a f t f r m i t s m o o r i n g s

T h e M c M u r r a y o s t e o t o m y i s n o t s o s m p l e a d
n o n h o c k p r o d u c i n g a s o g a l l y t h o g h t

T h e c a s c h o s n f r t h e o p e r a t i o n s h o u l d b e e
l c t e d c a e f l l y f o m a l o c a l a d g e e l s t a n d p o t
T h e m u s t h a f i r l y s b l e h e a d a n d s o m e f e m o a l
c k a d t h e p a t i e n t m u s t b e a g o o d s u r g i c a l r i s k

T h e p a t i e n t s s h o u l d r e c e i v e d e f n t e v e l l g u i d e d
p e o p e r a t y a d p o t e r a t y p h y c a l t h e r a p y a n d
g e r a l s p p o t v e m e d i c a t i o n a n d n u t r i t o a o u t
l d b y t h e m d c a l c o n s u l t a t . A s t h p s t
p e a t i v e p e r o d g o e s i n t o t h e t h i d y e a r o r m o e
t h e r e m a y b e a r e t u r n o f h i p p a n h c a u s e o f l c l
c h a n g e s i n p o s i t i o n o f b o n y c h a n g e . A g o o d e n d
r e s l t b y t h s m e t h d g i v e s a p a i n l e s s f u n c t i o n g
h p h i c h e n b l e s t h e p a t i e n t t o s t w l k a d d e s
w i t h c o m f t . T h m e a n a g r a d u a l t o t h e p a t i e n t
v h o p r o s t o t h e p e r a t w h a s g p e r t e n t
l o c a l h p p a i n a d w a s c n f i n e d t a b e d o r h l
c h o r c o m p l i c a t e d t o u c r u t c h e s . T h e M c M u r r a y
p e c a t i o n f r i e e c n s t r u c t o f p a s s i f l o n o u s t e d
h p a l t h u g h a p p a r e n t l y m o e g e r a l l y a d a p t a b l
t h a n o t h e r m e t h d s o f e a s i e c u t a t i o n a d p r b
b l y g i g a h g p e r t g e f p i n l e s s f u n c t i o n
u n g h p s s h o l d n t h e u n i c r a s s l y d i n s u c h c a e s
N o w a s a l w t h e s r g e e p n e n c e d i n s c h
p r e d u r e s i l l c h s t h o n e h c o i d e r s l e s t
a d p t e d t o t h e c a s i n h a d

R O B E R T P M O R R O W M D

FRACTURES AND DISLOCATIONS

B n t t J F H T h m n S B i n g h m A k K y
J A d W o t e n l i m M H T r e a t m t f
C o m p o d F r a t u s b y E a l v W u d S t u
a n d l e n i l l n L f L d 945 48 3

T h e g u m s t h a t c o m m e n d e a l y r e p a o f
f l e s h w d a p p l y w i t h e v n g r e t r f o c e t e a l v
c n e r s n o f o p e n f a c t r t o a c l e d o n

T h e r e s l t s f t h i s p e c u r e e s a t s f a t o r y
t h o s e i n u n c m p l c a t e d f l e s h w o n d s a n d t h s r e
p o t d e c r e b e s t h f i r s t 62 c a s e s t r e d . A l l o f t h
p a t i e n t s r e c e i v d p e n c i l l n l c a l l y i n t t h e w n d
L a t e r i n t h r e a m o r p n i c l l n w a a a l b l
o m r e c e i v d a p a n t a l c o r e a e l l a l t h g h
w i t h t b v i o u s d i f f e r n e e i n t h e r e s u l t . O f t h 62
f c t e s t a d 58 p e r c e n t d f m a r y h l n g f
t h o s t t e s e n d 2 h a l d f p r m v n e l f
f o r g n b o l y i l f t h e s 60 p e r c e n t d t n m a l
h n n T w o e s u l t d i n f a l r

Burns B H and Young R H Comp und Frac
tur of th Fem Tr ated w th Aid f
P n ic illin La t L d 945 48 36

When a débride ment has been done some days previously the use of penicillin makes it possible to sew up infected and purulent wounds and to encourage active movement not only without danger to the patient but with positive benefit to the limb.

These methods were occasionally used before penicillin was available but now they can be used with greater success and safety. Formerly, as the danger of spreading sepsis that was lead but not with penicillin, the very assurance that as so as staphylococci staphylococci a dangerous bacillus enter the blood or lymph stream that they are destroyed.

A possible reason for the lack of enthusiasm shown by the surgeons for the use of penicillin in the treatment of the murine myoma is that with the exception of the injections they have treated their cases in the conventional manner. The skin has not been sterilized as early as possible nor has early mobilization been encouraged. Certainly penicillin does not have a dramatic effect on local sepsis and does not prevent the spread of but that prevents invasion. For instance the bacteriodesis is not amputated and the patient remains in the authors' hands and it is noteworthy that Fulginiti and Clark (1944) who saw the whole picture to have a very large amputation assisted by the effect of penicillin in these cases also had no deaths from sepsis and amputation for sepsis in their series of 7 cases. In fact it is treated with penicillin while the thigh is still there and 3 deaths and 4 amputations due to

Nearly all the patients had had me per-
for arrival but the doses; trans v l th
delimits b that dos g a d number of j c
t s On alth y ere immediately st t d n
a fi d y course of oo u ts g e tram scu
la ly every three hours

My of the p t s a n d w t h t m p t u
 fab t o o F d pulse rate f f m o o t
 per m ute Th t mper t m t l t h m sub
 ded a week ft suture S metim s th p cll m
 mitt d h f e the t mpe t had t t l d
 Th tempe at e was n t thought t h l h
 gude fr p e cll s metime n t l th c
 f pyre a Bett d ce of th p t nt prog
 c l d be obta d f m in p ct n f th l cal d
 g l co d s a d f th ha h l f b
 week or so by n t mat n of th h m gl b

The sutur g wa t determ d bact l g
cal fi ds but n a atom l g ds l f
w s believed th t only tr pt c cc d taphyl
oc n ld b k ly t t r th blood a d th y
w ld there be d tr y d th gh th act f th
pe ll The th rs f d th t th p cill

I t c microbes ha t d cy t g t
 pt ma sp d g p It p b bl th
 th fi t m s local a d that th y t la g h
 s r phytes If th w d t l th y h
 no p b l i que tly d off

As always taken at the time of the first spectrolytic undulates in the 70 cases with the streptococcus and staphylococcus aureus found on culture. Many of these were harbored by the coliform bacilli and the methicillin-resistant *Staphylococcus aureus* and the pseudomonas pyocyanus. The streptococci and staphylococci had been killed by the penicillin and any pus was due to gram-negative organisms and was only mildly toxic.

Drainage is not desirable in these cases. It is probably better to include gram-negative organisms than by leaving the wound open to allow access to staphylococci and streptococci which will grow after cessation of the penicillin particularly if a thick layer of granulation tissue has formed a barrier to systemic penicillin. With a sort of drainage the ease is the possibility of two days' fice. Even penicillin tubes seem to do more harm than good as a sinus often developed but as a rule this healed in a week or two. The reason to suppose that it would not have occurred if the tube had not been inserted. In instances in which a penicillin tube was inserted the organism could reappear after the removal of the tube.

With or without drainage there as of course
I sprang up as it is necessary to open
abscesses rather than through the
organism in fact, in 2 completely sterile
cases was it necessary to open the wound. There
was no cellulitis lymphangitis, epitemia
Loculation in pus did not occur in any case com-
pletely sterile.

Suture of a partial suture by bliterating the
d d space p v nts a p cket a d e n when the
wo d s not s t d o v m e t l t h k n p o
d c e a p u m p i n g e t o f t l q a d i c p and the by
l i m i t t h e s e o f t h e p o c k e t b y e m p t y i n g i t e r y
t m e t h m u s c l e c o n t r a c t s I n n o i s t a n c e a
p o s t e r i o r c t e r i c i s i o n n e c e s s a r y w s i t
e c c e s s r y t h a d e n d e t d a a g b y p p l y
a s p c a d t r m g t h p a t t h i s f a c e

Only 4 of the 48 completely treated cases had a sinus thrombosis while 9 of the 22 completely closed cases presented us.

U f t se c mp d fractur s proceeds a q ckly as or eve m q ckly th in closed frac t r s It may be that th hype m caused by the c ntr lled infectio plays its pa t

It is extremely useful and also quite unnecessary to mention the bone fragments unless you callously hope that they will be displaced. Let them rest in place of the most important fragments because they are easily incorporated in the bone. It is remarkable how a mixture of small bone fragments and pieces of metal grows together in the end.

1 62 cases th erag tmc fu n judg d f om
 the um f d sca d of all spl t g was th t n
 ks w ght h ing s ll w l ab ut two
 kst ter in g cases ag fit rei f ce a sle d
 br dge f bone will b necessary Two cas s ill not

ti ts wh died Po ti e blood cultures were ob
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And II P O Tt mh of th Int mal C r tid
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Th mb is f th nt mal car t d rt ry s ra ly
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A G Mo M D

V al J R nd II y ll II S g ry f De p
V us Thrombosi of th Lowe E t mity
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l 6 i o f t h 8 4 c a e t h f r s t s y m p t o m a s j a m
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x a m i e d f r i t l l m a n s s i g n w a p o s i t i e 6 8
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l u b l i f c a s e

I n 1 6 o f t h 8 4 c a e s i u l m a y e m b l s m a t h
t a l s y m p t o m l i n 3 a d d i t a l c a s s p u l
m a r y e m b l i m c e r e i b f s g c a l l g t
T h a u t h r n t d n c r e a s e s t h e m b e f l i
m a r y m l l t h i n c e i g g e T h e v l h e
t h t p u l m o n a y e m b o l m i s a p o t e n t i a l d a n g n
r y c a e o f e n o t h r o m b o i a d t h a t t h r n o
s a f p e r i o d i n a n y f t h e c a e s i t h f r s t f u
m o n t h o f t h d e a e T h e y a l s o s t a t t h a t t h l
a p i c t u r e o f c a s e s u n l a b l f o r d e t m n g t h
l k l h o o d o f i l m n a y m b o l u s O f t t h m
b u i n t h i l e i n o t f i x e d t h e t m a d
r e p e a t e d p l m y e m b o l m c o m m t h e s
c a e s o m e t i m f o d v o r e l s

P l m n y e m b o l m o c c u r r g a f t r i g t f a
m a j e n m a y i g n a t f r o m r a l s u r c e t h
m o s t f r q e t f w h i c h i s a t h r o m b o s s t h v
o f t h o t h e r a t m i t y I t a l o m a y r i g n a t e f r m a
t h o m b u i n t h l g t e d c i n b o e t h l l o f t h
l g t f m o t h e r e s i t h e b o d y o f o m
t h r o m b n t h i g h t d e f t h e a t J n o o f t h 8 4
c a e s t h p a t i s h d p l m r y m b l i f t e l g
t o o f o n e o r m r e e i b t n r y c a s e t h e
h a d b e e n o m r e j i o d e s o f p u l m a r y m h
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f m t h p p o s t e u o p e r a t e d e t e m t y a n d i n 4
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T h e t e 9 8 c o n c u t i p e t o n o n t h e s 8 4
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T h r l e t b e f o l l o l i n l g t i n i s l i g a t e t h e
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n o r m a l s e g m e n t j u t d i s t a l t o a m a i t r i b u t o r y a n d
a v d a b l i d d i i w h i c h a t h r o m b u s m a y f
T h e c g e a t d g r f a e c u r e n t t h r m b o s
w h e n l i g t p e r f o r m e d t h u g h a d i s e a s e d s e g m
m t l a c i e e t h o u g h t h e c l o t m a y h a v e b e e
r e m o d e r m a n o t h a e x t e n d e d t o t h i s l e v e l o f
t h e v e i n

T h r m b e c t o m y c a n b e d o n w i t h o u t d a n g e r p r o
v i d e d t h e c l t s f r s h a n d u n a t t c h e d t o t h e i n t i m
a n d t h e v e i n l l s f r o f n f l a m m a t o I f t h e c l t
i s l d t h r o m b o t o m y t o o d n g e o b e c a u s e o f t h e
l k l h o d f d s l d g i g f r a g m e t s o f t h e c l t

I n c a s e s f p l m o y e m b l s m f r m v e u s
t h r o m b o s e v e n t h e h o j c l e l y l l p a t i e n t i c a n
d i d t e f f r v e n l g a t o N e o f t h e p a t i t s d d
f r o m t h o p e t i o n I f o n p e n i g a v e i n t h e i n f l a m
m a t o r y p r o c e s s e e m s t o e x t e n d b y o d t h a t p n t
t h i c i n s h l d b e c l o s e d a d t h e v e i n l i g a t e d
h g h e r T h t e n a l i n e v e i n w a s l i g a t e d n l y 6
t i m e s s e t h e p r o b l e m o f t h c l l t o a l c i c u l t i o n
m a k e s l i g a t i o n l e s s d e s r a b l h e A l l o p e r a t i o n s o
t h e l a c e d o e b y t h e e t a p e r t o c a l r o u t
a l n a l m o t e y c a s e a d e q u a t e x p o s u e f o e
p l t n f t h e i n b f o r e l g t n w a s o b t a d
T h a t h r s e i a g r e m e n t w i t h t h e i d e a t h t
b i l t e r a l i n j e c t i n s h l d b e p e r f o r m e d m o r e f e
q u e n t l y

I n 45 c a s e s i n v h c h t h e w a s n o p r e c e d i n g p u l
m o n a r y e m b o l s m p i o t o l g a t o o n e d e v e l o p e d
f t e r o p e r a t n S i n c e t h e c a e s o f d e v e l o p g a n
e m b o l u a r b u t n o i n t h r c i t h e t y p e o f t h r o m
b s s u d e r d c u i o n t h s i s i g n i f i c a n t a c h v
m e t O f 3 9 p t i e n t s i t h p r e l i g a n e m b o l m g
h a d e m b l m f t e r l g a t i o n I 8 f t h e s c a s e s i t
w a t h r e s l t i f a d e q u a t e s g i c a l r t m n t
r a t h r t h a t h e f a u l t i f t h e p r i n c i p l e i f t h r a t
m e n t

T h a t h r s a l o h a e t h m p e s s n t h a t f t r
l i g a t i o n t h e c i l s t e n d n c y o f t h e t h r o m b u s t o
e t e n d b l w t h e l v l f l g a t n a d t h r e f o r t h e
p t e n t v e s c h a n e l a r e l e f t a s i a b l e f t h
c o l l t e r a l c r e l t i P a t n t s w h o h a e h a d t h
c o m m o n i l a c i n f r i o r v e n a c a l i g a t e d u u a l l y
d l p a m o r c o m p l e t e c l l a t r a l c i r c u l a t n t h a n
t h s h o m t h e t e r n a l i l a c o f e m o r a l v e i
l g a t d

T h f u c t i n a l r e c r y o f t h e t e m t y a f t e r
l g t i o n i c e l l t T h e p a i q u i c k l y r l e v e d n d
v a s o s p a s m s u l l y a b l s h d p o m p t l y T h d m a
w h c h s m t m e s t m p o r a l l y i c r l a f t e r l g a
t n u u a l l s b e s a f t e r a f w d a y o f e t n d
l e t i o n f t h t e m t y T h e w r g o f a n a d c
t o c k g w h e n e t i t y i s r e s u m d i a d j u s t a t l e a s t
t l d e m a l n g e r d c l p o s a e s l t a c t i t y

R o r R. B i l l o n M D

Blakemore A H and Lord J W J A Non ture
 V thod of Blood Vessel Anast omos a E p e i
 mental and Clinical Study J Im M f 1945
 7 685 748

Blakemore and Lord describe a suture method
 of blood vessel anastomosis employing viallums
 cuffs. This method consists in threading a vein graft
 through one or two cuffs and everting the ends of the

veins against the cuff in such a manner that the
 the red end of the artery may be slipped over the
 the red vein, thus (Fig. 2)

This method affords a broad vein anastomosis to artery
 intima to contact to heal. The holding ligature is
 well away from the flow in blood. In the presence of
 bacterial contamination this type of junction would
 seem to offer an adequate area for the suturing

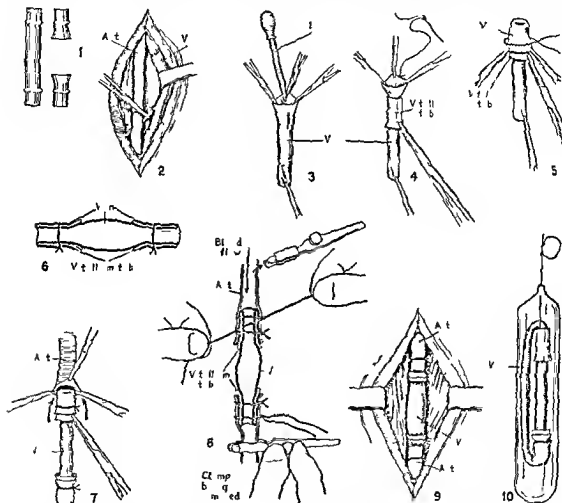


Fig. 1 Open the cuff of the method
 Canula and tubes (Fig. 1) in single
 (single) Rm al f n graft note that the branch is
 used close to the n w th fin l k b e f clamp g 3
 irrigation of g f t h t m s o l t o o f sodium chlo-
 ride t w h h a l l a m t f h p r m v b e d e d i f
 des ed 4 Method f m g u l t a n d f i s s w t h m v
 q to amp Cuffing and securing entered d f m
 th viallums t b e 6 D u b l t b e t e c h n i q u e
 g f t m u t e d 7 l i o d u m t h d i s t a l d f t h
 g r f t m o u e d n a t a l l m t b t t h p m m l
 e a d f t h a r t r y 8 T y u n g i n s u l k g a t c a j t s a g g h

t p n t blood f m p e t r a t i n g b e t w t h m a n d t h
 r t r y t u m a s A l s o l e a s i n g t h p m m l r u b b e s h o d
 l u m p f i r s t t f c u l t a t t h p s s a g e d t a l w a r d f m y e
 a d a l s u r b b l e s t h i n t h g r a f t q C r u m t e d a n a s t o m o -
 s t h e s e a s c u l a t i o n e s c l o s e d g l y o u d l n a s t
 m o s e d r t r y h e p o s b l A t w y f p e
 s e r v i s h m t i c a l l y l d n d i n a r y t s t t b e
 g r a f t s q c k f e a z i n g T h g r a f t m o t n e d t h i s o t n o
 s o l t w n f s o d i u m h l n d n d m u n t e d t a l l
 t b e t h u s u a l m t h t h e d i s p a s s e d t h r o u g h
 s e c o d t b e n d l u g h t o t h e f i r s t b e t p t e c t t h
 t u m a t u l u s e d A w s e r v e s t u s p e d t h e g r a f t

in the latter the vessel wall which is compressed in the suture line and is somewhat strangulated. It is difficult to contact the flowing blood. The joint is leakproof in the presence of antiseptic and there is no flow of blood from the other end because of blood to intima contact with the aortic suture and little or no stimulus to thrombosis. It is noted when the blood clotting time is normal.

The method was preceded by successful preliminary experiments when it was shown that a 90 per cent percentage of success in bridging defects of the small femoral arteries of dogs without the use of anticoagulants is possible.

As in the Carrel suture technique the performance of débridement and the use of sulfonamides greatly hasten the percentage of successful end results. If we delay anastomosis in contaminated wounds secondary hemorrhage occurred only once following the nonsuture technique and this is a tendency for hemorrhage which no sulfonamide was used. An aneurysm either at the artery-vein junction or in the vein graft has never been observed in the no suture anastomosis.

To gain information as to whether the plastic vessel will function adequately to prevent gangrene when used to bridge arterial defects the right hind leg of two dogs was amputated at the mid thigh level. After an interval of twenty-four hours the legs were reamputated and the non-suture tube technique was used. A dog was grafted from a third and fourth animal were employed to bridge the defects in the femoral artery and vein. The amputated limbs were preserved in cracked ice during the twenty-four hour interval. The dogs were given sulfathiazole (1 gm twice daily by mouth) from the time of the first operation.

The survival of the legs in these two dogs depended solely on the function of the segments transplanted from the dogs and in this case the experimental results were critical. Heteroplastic vein grafts to bridge femoral artery defects in additional dogs have been used. The tomography indicated for twenty days (average) which showed by joint palpation that the four dogs had post-traumatic edema.

The preservation of the grafts has been found adequate in the segments of veins especially from an alcohol solidified carbon dioxide mixture and kept in the frozen state. These frozen grafts functioned quite well as heteroplastic grafts to bridge arterial defects and without the use of anticoagulants. A segment of human saphenous vein used to bridge defects in the dogs as a task performed by the dogs in the cage and the quickening and preservation for three weeks before it was used. As may be kept for a comparatively long time periods.

Reported in the literature has been called that within a few days the grafts at the end of the complete fixation may be completely completed with a firm union by the arterial pattern. It is reported that in the wound of the limb to be transverse and the sacral of the self is



Fig. An anastomosis of the distal femoral artery to the middle of the anterior tibial artery.

necessary in the demonstration. For these reasons a method of blood vessel anastomosis to be successful and practical for war use must be easily adaptable to the use of vein grafts and any length. The nonsuture anastomosis fulfills this requirement and unlike a suture anastomosis a considerable discrepancy in size between the graft and artery, no way complicates the technique and efficiency of the method. The majority of the wounded soldiers will have intact veins which are suitable for use as grafts such as the cephalic vein for anastomosis of the common to arteries and the external jugular great saphenous and femoral veins for the anastomosis of other arteries. These instruments are removed quickly (in from ten to thirty minutes) for use as transplants to bridge arterial defects.

Case histories presenting the application of the operative method emphasized the need for (1) immediate control of hemorrhage (2) the time for shock (3) control of pain and vasospasm with papaverine hydrochloride (4) chemotherapy (penicillin is undoubtedly the preferable agent in these cases) (5) preservation of a lower temperature in the wounded extremity (6) position of limb (when at rest in transport the limb should be placed at right angles to the body from the chest below the heart level this elevates the venous pressure in the extremity just enough to maintain the blood may a venous thrombosis complete deoxygenation).

Irrigation of the distal vascular tree with saline solution containing penicillin and heparin wash out the material from the blood stream of veins and places penicillin in adequate concentration in the

curring before death. The alterations in the intramuscular pressure are noted in the dynamics of the venous pressure mechanism and after operation showed a constant coincidence between (1) the loss of muscle tone, (2) a loss of venous pressure and (3) the appearance of peripheral circulatory failure.

The studies are described in detail.

1. Within certain limits a considerable reduction of circulatory blood volume is compatible with an efficient venous circulation. It is provided that the intramuscular pressure of the foot is important; the dynamics of the peripheral circulation is held at an adequate level.

2. A physiologically effective venopressor mechanism coincides with an adequate peripheral circulation. It is one that has failed in coincident with the appearance of circulatory shock.

3. A normal peripheral circulation coincides with a normal change in circulatory pressure. A normal venous pressure of a reduced plasma volume.

4. Human plasma has a decreased pressure action on the circulatory system.

5. Nephthamide has a marked pressure effect on the intramuscular pressure. The pressure action of plasma is slow as it requires from seventy to one hundred minutes and the administration of 750 c.c. of plasma is necessary before the pharmacological action becomes manifest. The effect of nephthamide on the peripheral pressure is very rapid. It also heightens the venous pressure mechanism within from five to ten minutes after its administration in doses of from 5 to 10 c.c. as contrasted to the sensitivity to human red blood cells of plasma.

6. The pressure of the dynamic factor of the circulatory system (first threshold level of

the intramuscular pressure and late threshold of the venous pressure) corresponded more closely to the appearance or regression of peripheral circulatory failure than did changes in the plasma volume amounting to less than 500 c.c. (approximately 2 units of plasma).

The authors believe that the chief lesson to be derived from their studies is that greater emphasis must be placed on investigations of the dynamics of the peripheral circulation rather than upon the volume of blood that is available for the circulation and thus must be done at the bedside.

MATTHIAS J. SPERT, M.D.

Diamond, L. K. and Ahelson, N. M. The Demonstration of Anti Rh Agglutinins in Accidents and Rh Blood Transfusions. *J. Lab. Clin. Med.* 94: 3.

4.

The development of antibodies against the Rh factor in the sera of Rh negative individuals may result in intragroup hemolytic reactions following transfusions of Rh positive blood cells.

According to the authors the present laboratory tests for the determination of anti Rh agglutinins in the sera of sensitive individuals are inadequate. It is claimed that with the block test of Wiener and the incubation test a more adequate result may be obtained in 50 per cent of the examinations. This is believed to be due to an inhibitor substance which interferes with agglutination.

As a result the authors have devised a slide test which demonstrates Rh sensitization in a high percentage of tests than heretofore and thus gives a truer clinical prediction of in vivo blood reactions after transfusion.

B. JAMIN, G. P. S. ROFF, M.D.

eight tenths days A little v o e b H of these cases received an average dose of 27 gm of sulfa drugs over a period of s x days In the Ital n theat 9 f one group f 3 f ctu es we e clo ed and 71 of these were closed successfully failed to close a d f thes nly escap d h n mf ct

During five years of war the e has been ch nge of opinion f m th clos d plast r to open wound t atment and now to del yed clos in 90 per cent of all compound fractu es A gre t sa g has b en made in b th lif and l mb and a red ct n n ho pital days The e i htl vid nce th t ch mother py is espons ble fo th mcr ased succes Two groups of cases have been t d d th one gro p r c ving prophylact c pen cillm the oth receiving th r inadequ t amounts o no penicillin therapy Th use of the H namides along these s me g neral p niples has b own a similar esult Early adequate ug ry compl t mm bilization and soft t s suppo ta st l th basis fo s ccessful nd results

RICHARD J B NNETT J M D

OPERATIVE SURGERY AND TECHNIQUE POSTOPERATIVE TREATMENT

B njamin H B Ahrenberg H W and F u r
l s G J The Subma o al M cellat u f
H morrh lds A S g 945 39

M thod empl yed in th ea ly 800s by the F neb surg ns a estill nu f sth surgical tre tment of hemo hoid N rly eryone has hemo rh ds in one form o th r and the c mpl cat f hemo rh ds nd hemorrh d ctom es m y b very d t essi g and oft times d abling

Since th pre ent war the authors hav een ma y yout g men devel p hemorrh d b aus falter d det nervou tens n dl kof propert let f ch t es

In vew f the f t th th morrhoids sthe t n lo e t mal ar in truth v nco e v ins f th rectal a ea t is d fficult t done the p es t d y p ctic f clamp d cis n Since the dise e s of th blood v sel primarily ther s n d f r th sug on t s crif el g mou t f th ectal m s und ly g conn t v t s e and v m s el An pt nalooy w uld b that f su con wh n att mpti g to cu th pat e t f vanco t of the lower tr m ty m ly cl mp d cr ss th v rix nd s d skin m sel a dev n n rves

The auth rs techn que f h m rrh dectomy s l ng a t m li nd t att mpt to p s r v a n rmally f n to ing ctal t b e Th result has been that th m m n qu lae f b m rrh dec t my ha b n d c d to a minimum a d th op ation itself h s be n rpr nly s mpl fied

The esth t c f h c is caud l bl ck local infiltrat n a d the p st s s d ha eb n th the lith tomy th Bu p t n A ca e f l p to cop e am t on is r t n ly carr d o t v g rous anal dilat s ne d ne A mall l ar c si n pepend ular t th x of th ct m

mad with the knif in the sk ppr x m t l 3 cm from th base f th first extem l b m rrh id Th incision lly just outside f th p m ted rea wh ch s rounds th us r appro imaf l y 2 5 cm f m th mucocuta eous bo d \ t the meial dg of th i sed sk s gra p d with a All s fo cept Hold g the f reeps up on th ha d th muc us membra e s d s ect d f f m the hem rh o w th V y c sors Th d t s the car ned pw d l k m w th th fi ge in th ct m gu de ntl Hilt l a h d Th compl h d th nti d d hem rrh d l es s l s mo c ll t d by h t b tes w th the ci rs After compl t ca y f l m r l l t the se sors a e withdrawn a d y d nd t e cess e muc us membra e is r mo d w th V haped exc s on A m lar p ced u carr d t th m g h m h daltags An p rca e gau p ck may b i s t d f r hemost nd m ed th fll g morn g H t sitz b th st tut d the th d day HARRY W FINE M D

B w n M J Surg ry t High Altitude Am J S g 94 67 436

The St t H spital at Camp Hale i th Rocky M tain C l do us d the local fr th r p t Th lttud oo f t Th b r m t c p es e s d ced f m 76 mm of mercury to bo t 5 mm f m c ry The p tage of y gen th r s b t th me at s l v l Th o h th y g n the pat l p es e of al ol r r r de r d f om 6 to 9 mm f m cury

Eth r al eo n c mb at o was n t s t fa t r y d when t w sadm at d by th p d p m th od ah t w e th al m u t ed d f a o d n ry ope t w eq u r d at that ltt d O p n d f eght n mo ths th ext t of the u e of a esth t cage t wa s foll ws

	Anesth	Ag	N f T es Used
Local	ocain		6
Spinal			
	A P ocain HCl		68
	b P tocan gl		3
	Sodium pe t thal I V		
T p cal			6
N r v	f l d bl ls		54
Inhalat	th t es		

W th the p nal anesthsia th e ere m n r co p hcat o s ch a nau a mit g d p f blood p essu e d p l l r The e w e r 5 f l u s th pinal nesthes Ther w o a esthet c d ath Wo nd h aling was n t lte d by th h ge f alt t d Th e wer 76 m j pro d res d 1 684 mm p ed es Th r we 9 p m ry wo nd infect Th e w e serum pock t r mall h m t m Gas ga gre d l p d n compound f ct e f the d a d l wh h had been t eat d su cally Wo d h l p m r y d d r y n f ted wo l s w a would h xp ct d th m sth t to d r y l t des B h l g w s n t d l yed Th w re

Untoward reactions following the administration of the substance were seldom observed in fact they occurred only in connection with 3 injections. In 1 case the patient became nauseated and had a single attack of vomiting after receiving 10 milligrams by mouth. In another there was a general sensation of heat, light perspiration, increase of temperature, a diarrhoea lasting a day and in the third there was a leukoenteric diarrhoea and rise of the temperature to 39°C. In none of the cases were the symptoms of a dangerous character.

The effect of the artificial radioactive substance on the hemoglobin percentage and the white blood count was as follows: the fall in the white cell count and the reactions observed were similar to those after the exposure to roentgen rays. In the cases of lymphatic leucemia the hemoglobin percentage was almost unaffected although radium sodium speedily penetrated the erythrocytes. Only in 1 case was a count made of the thrombocytes which seemed to occur in increased numbers after treatment with Na. On the other hand there was a fall in all of the

cases except Case 3 (which later proved to be refractory also to roentgen treatment) a marked effect on the number of leucocytes in the blood especially after the largest and most frequent doses. No effect on the differential count could be detected. In several cases about a week after the beginning of the treatment an increased swelling and some tenderness of the palpable lymph nodes or the enlarged spleen was noticed and this was followed by a more or less distinct diminution of the size of the organs in question.

The change in objective findings was accompanied as a rule by subjective improvement: the patients became stronger and the itching of the skin and the perspiration grew less or ceased altogether. The effect of radioiodium on polycythemia vera was only slightly and transitory.

The number of cases of leucemia treated is yet too small and the time during which the patients have been observed too short to warrant any definite expression in regard to the permanence of the effect described.

JOSEPH K. NARAY, M.D.

e e l o t e o p o r c v n d t y c a l f a t
It s f i t e s t h a t f n o s y s t m a t c x a m i n t i o n
m a d e t h e f r a c t u r s m t i m e s i n t d i c o e d u n t l
s e a l m n t h l e t e w h e n i t a l r e a d y m a y b n t h
p r o c e s s o f h e a l i n g

i n n e c a s e p a t f t h e h n e w a s r e m o v e d f o m t h e
f r a c t u r e d a r e f o r m c o s c o p c s t u d y i t w a s f o u n d
t h a t t h b n m a r w a s d e s t o y d a d t h p e
t u r e r e s e m b l e d t f o s t e a t f i b a l a d u g t
n e c h i o s s o r n e c r o s s o f t h e o s s e u t i c T h e
w a s n o c e l l l a t i n a n d t h o s t e o b l a s t s a s w e l l
a s t h o s t o c l a s t s w e c c m p l e t l y a b s n t T h s s u g
g e s t s t o t h e a u t h o r t h a t t h e p m r y c a f i j u r y
i t h d r c t e f f e c t o f t h n i n g n r a y s o n t h e c e l l f
l e m e n t s t h m s l v e s T h e n u t t v d i s t u r b a n c e
c u l t i g t h f r o m t h e v a s c u l a r c h a n g e i c n t b u t o r y
f a c t o

T h c o c l u s i o n s r e c h e d t h a t s s c o u c h g s f
t h e n e k o f t h e f m r r e p r e s e n t p s b l c o m p l i c a
t i o n s o f h v v r d i t d u r g t h t a t m e n t f
c a c m a o f t h c r i t u t W h e e v s u c h p
t s d l o p p i n i n t h e h i p a d t b d g a t
i t h u t t h e b n g g y n o l o g c a l v i d n c e f c u r
r n c e f t h e c a c u m a r a y a m i t n o f t h e p f
v i s h o u l d b m a d u n e l y T L e v r i a M D

MISCELLANEOUS

Thy n J E V i d b a c k A n d W i l l u m I T h
T r e a t m e n t f L u c m i w i t h A r t i f i c i a l R a d
a c t i S o d i u m A c t a d i S t k h 944 5 339

T h n t e a l d a t i o n t h e p v w i t h a t u f a l
d o a c t i v s u b s t a n c e s o f f e r s t h e f l l o w i g a d
t a g

B y e n t r a l o r p e t e l a d m i t t e o f t h
d i o c t v e u b s t n f a r m c a m t m e c t t
b e t w e n t h u c e f t h e a d t n n d t h e b j c t s
e s t b l i s h e d t h n c b b t i d w t h t b l
a d m t h a p y

2 A s t h h a l f l i v e f t h t h e c l r d c t
s t o p w i t h a f w e p t r n v r y h t c m
p a r e d t h t b l i f e f r d u m t h e f f t o n t h e
g a i m s o n l y l m t e d n t u m t b t t d g e
p o b l e A s w k n w t h p e m n t d t n
f m d p o i t d r d u m r t h r m c a e s c h c
v t c a t n w t h p l a s t c n e m a d t o n
s t e i t n d t h e f m t n i s c e m

3 T h e i n t r i n a l d o n c a n b g i n t h t t s
e f f t w l b e t h c h i f y l c a l d o m o g l
d a c c d g t w h t h e t e i t p e g v a c c u m
l t e s n t i n r g n o d s t b t e s t e l f m d f
f s e l v T b l c a l d d t n w i l l a d b t b e
t h o w h h w l h o f g e t s t n t f t h p y

4 f t p b l t o g v l w t n t v v t t
m e n t E p e m t s n d a s o n i n g m t n d c a t
t h t p t c d d a t i n w i t h l w n t e n t y b a
m o m a r k d l y l c t i c t n a p l a s t c d
l u c m t s u e t h n m i n t n s d t n f
h o t d u t n b c a s t h p t i n g c a l l a c c u
m l t e t h e g n y e r g y m c m p l t l y t h n
n o r m a l t s u e s w h c h g n t q k l y d p r
t h j u i e s c a u d y h t d t n

5 T h c t n o u s a t i r e s l i t i f r o m t h e
u s u a l c t e n a d r d i m t h e r a p y a r i e d
T h e o t t e n v e r t b l e s m e y n t i c a t n c a l
b y d e c t r a d t h a p y i s e n o n l y m i l l f m
w t h l a r g d s e s f d i o c t i e s u b s t a c c

6 T h d y d s p e d p p l c a t i n l l
t m a d i m a y c a s e s w i l l m e t p o s i b l e t e t
t h p t i t s m n m b l t o r y m a n n e r

A d w b c k t o i t e n l d u m t h e r a p y i t h a r t
f i c l d o c t i v e e l e m e n t s m i g h t b e f d n t h
l a r g e a n d c o t l y a p p r t r e q u e d b u t t h s m e
d r a w h a c k a p p l e s t o c e t i e t e n t t o r d
a d a t t h r a p y T h e d o c t i e b a n c e c a

d f y b e t r a s p o r t e d p o d e d t h e t n s p o t a t o
t u m d e s n t c s t u t u t o o l g e f c t i n o f t h e
t m e w i t h w h i c h t h b t c e d c a y

T h e o l y t i c a l d o c t i v i t p s d s o f r
f o r i n t e r n l t a t m e n t o f l e c m a s r a d i o p h o
p h o r u P n a p u r b e t y m t t r w i t h a h l i f e
f f t u r t e e n d t h r e t e t h d y s T h e a u t h o r d

n t h e b t d o o d i m N a h i h m t
b e t a y d y h a d g m m a r a y h d r t h n
t h o f r m d m a n d h a h a l f l i f e o f f t n l
e i g h t t b b s T h m e r o f i t d t r b t i o
n t h m l g a m i d f f e n t f m t h a t o f m o s t
f t b t h e t f i c l a d a c t i e s t o p e W h e

t h e c u m u l t m o e r l e i d f f e t r g s
a d o d m f o u n d a l m o s t l u l y i n t h
t n t l u l f i d o t h a t i t d t h t n
n d y a c t i s d i f f s I c t t t r a d p h o s
p b w h i c h v r y l e s t h e b l d t e a m

l m o s t n s t t l e l s o b t e d w t h d s o d i u m
s o a s f i t n m u t e i f e r i t s j c t i t h e
v T h e r e t i w h i b t a k e p l a c e t h r o h t
c s r y l R d s o d m t h f o s e m

t b e t b l f o t e l g e a l l d t i o f l o w
n t n t y f t p b b l t h t t g a t t m e f a c t r
b c m a y t b y w a y f e t u z g t h e l u c e m c t

t b t t h e m g b e t e n t h e r a p y a t c a n d
t c d b e c m e w d e E t a l l l v e o e t g
t t m e t w t h m l l f a c t o a l d s e s h a s l r e d y
p r o v i d f l u e l e m i f o a m p l n c a s
t h t h d b o m m o l f r c t r y t i c a l
r d t b t t h e m e t h d p e s e n t t e c h c a l d f i

c u l t e b e d e s b g e p n s i
W h i d p h o p h o r u e m t s l y a d d y b b
b l b t y s d o s d m e m t s l o v e r y h d

g m m a y w h h o n l y p t i y a h h e d e
t h c k l y e r s o f t A c u i u c n s e q e c e f t
s t h a t w i t h m a l l r r d a d o b j c t s h a s m
n l y a l l f t h e g m m a d t i l o s t

E i g h t p t s w h a t e d w t h a d a t s o
d u m v 7 t h c l y m p h a t c l c m a d i
w t h p l y v t h m e a A f t b o l n g a d d l u t o
w t h p h y o g c a l d m c h l r d s i t u t o a J
u m f c t h e b t a c w a s s l w l y n j c t e d i t h a d
t h e a s a p o s b l e f t e t h i t h a d
b e p e p a d i n n c a s w a m o e t h o n j c
t a g d l y T h e s g l d o s v r d f r o m a t 36
m i l l i c u s t h e t a l d o s a g e f r o m 6 t 178 m i l l
c u s f m t 21 j e c t w h i c h w e u s u a l l y
g i v e t i n t r v a l s f t l a s t f r t y e i g h t h r s

Untoward reactions following the administration of the substance were seldom observed in fact they occurred only in connection with 3 injections. In one case the patient became nauseated and had a single attack of vomiting after receiving 10 millieuries by mouth in another there was a general sensation of heat slight perspiration increase of temperature and diarrhoea lasting a day and in the third the patient developed diarrhoea and rise of the temperature to 39°C. In none of the cases were the symptoms of a dangerous character.

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JOS. H. K. NAR. M.D.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Buch G E and W n T Th R lation f Total
In n ibl L of W ight to W t Lo f om
the Skin and Lungs of Hum n Subject in a
Subt op cal Clim t Am J M S 945 09 6

The rel t nsh p of in e ibl wat r loss f om the
lu g t wate l f m the k₁ h h n stud ed
ry b eflv Ma v ob rv rs have t died th t al
n en bl lo in w ght def d hv the eq ti
I L = I W + CO - O whe e I L rep e ents
the s n ble loss of e ght g m s I W the
grams of wate v p d d CO d O the
gas use cha g in th l ngs I W m y h fr
th r ep s nted s qu ll g I W s pl s I W z n
whch I W r p es ts the w tr gr ms lost i
s sibly from th sk nd I W p e nts wate
lo t nens bly f m the l g s In th n mal est n
subject I W r p es ts ab t 93 p t of I L
th g et p t f n ble w ht lo b ng d
t nns bl wate l s

In t d e c nduct d n no mal s h y ts th
me n rat f tot l n ens ble s n w ght w f und
t be 3.42 gm pe squ e mete f body s u f
pen m n tes The man t of l th ough the
lu g s was 70 gm d th gh th kn 63 gm
Th lo th gh th l g s s 52.3 pe c to f th
t t l n ns bl lo -ch e ght lost i blv
th ough th lu g s bei gab t th s m a that l t
th ough the sk n

Th man te of tot l ns bl ght l s as
f und t b the same fr oyo n whte d y g
n gro m l d it males Any dffe ces th
ad pt bly f th tw r est b t a d h m d
nme ts m st n t b r lated to c h g by ns
s ble pers p t

Th nsbl wate los th gh th sk m of o
d ad b des t d d h r tly aft r d ath sh wed m
m n ate f l s weight f o o gm Th c n
de d to be lost ma nly by diffu i n th o gh th
k Th l tempe tu f the kn f th de d ad
b des m t p b bly pl the slowe rat of
l f w t th o gh the kn f th de d th
th o gh th k f th lu g

Th kn an ffi t h b to of th l s f
w t by d f f s o S MUE KAHN M D

W lk J J nd Sh nkin H Studi n th
T ml Synd m ft Burn II Central
N rv u Sy t m Changes a Cau f Death
A S g 945 3

In the co rse f l cal t dy f h t ma
943 and 944 6 pat ts w b rv d t d f
udd n esp t a est t m wh h pat d
n l man festat f b t m b
d g D g th pe d ft m aches pat ts
b d a y g d g es f d iso n tatio a d dr

es whch led to stupor O ca l pat ts t
came ma acal or w r subj ct t h l c t a l
all sh w d my l us a d d e ta ce t
p m t A t psv v ry ca e b ta t
ted th imp that th w g c ch ges
a the b in d esp lly th c t d hypo
thal m

S c method f t at g b sh l h e m
p d a numbe f lv bur d pat ts
v th first fo ty eight h rs o ly to succumb d
i g th t f w d ys t what W lson nd h s col
labo t rs ba te m d t cm The e a
grate o les degree f ald m ge id ced
hy lgu i d azotem as w ll m b pat
i j ry

Th case h t es f 6 p t ents ba g s e
b rns a d e l cal d f d m g t th ce tral
n rv s sy t m a e p es ted F i f the pa
t t d d i d de esp at ry fa lure wh th
nal d b p t e d m g as ated w th b
t m wa d cr as g e ty Th s th pa
t t b d two psodes f ap du i g th to em e
p d h t s rv d t d i ty two d ys l t r f
p lmo r m bl u The b n th s ca e ho ed
id c f d m age f the me ty p b t f l e r
degr th n w s e th the spati t
G os am at f th b e l d e id c
f a d i trac al pes w th h n to f
the reh l t n s l th gh th fo m n m ag n m
mp g th m d l l

Ph t m c graphs of th ca es sho e i
t r s t l d m d g gl c l l ch ges h h
we fo d t be mo t m a k d th bypoth l m
It s ggest d th t th ch ges f th c t l
erv v t m a e imp t f f ct the
pl t f th dd d ths ccu r g th
t m pha e f b

J H E K r r M D

M L ughlin G W nd H l l nd J L S u
W t U lers f th E t mtl Th l O cu
n n J p n se Surv rs L S i M
B H 94 44 494

Th th rs pot th es f 3 J p r
ors wh h d b d f t f e b ts f pe d f
f m t l d y Th d d l w e f d
i th g ps Th y e f g l d t
pt that h d be p l w d d d
w fi g f m po d x b t All
rv rs h d f st degr e b f l l
pos d r f es Id t cal k l s s w e pes nt
n th f m legs th gh d b ttock f 6 f
thes rv rs l th l y stage th les as p
pe ed as m l l b l r s wh h becam plac d by
d e l t d g g f th k Thes a as
bs q tly l ghed l g l e rs h ch d
f mo st 3 m Th y app d p c pally
th c t n s r ur f ces of th e tr m tes F l l

these lesions appeared as deep circular or oval punched-out ulcers with a pinkish gray granulating base. The ulcer edges were extremely sensitive even though there was no inflammatory reaction. When several of these lesions reappeared the legs refused to walk, a moderate degree of edema of the feet or hands was present and fever ranged from 99 to 100 F.

Ten survivors showed similar lesions on the palms of the hands, though never on the soles of the feet or on the face. There was no response for these ulcers to coal-tar or potassium permanganate.

Treatment consisted of the application of sterile dressings with or without the use of antiseptics and sulfanilamide powder. The final therapy consisted of a careful cleansing of the extremities and the application of sterile bicoid ointment as directed.

Healing was slow. Smears taken from the ulcers showed few organisms. No difference in healing time could be noted in those cases in which the ulcers were treated with sulfanilamide powder as in the initial treatment, in contrast with those in which only sterile dressings were applied. A few pyoderma developed in one case. These lesions seemed to correspond in many ways with the so-called tropical ulcers or desert sores reported from the African continent.

The authors believe that the salt water, as the most important etiologic factor in the production of the ulcers, is a main deficiency and deficiency is considered as important. None of these and duals present in the patient's immunity factors. The lesions were apparently bacterial in origin. The prevention of salt water immersion and daily diphenhydramine upon the production of the lesions and duals admitted. If possible, some blood treatment should be applied to the skin of the patient and but the patient's physical examination by duals who are cast adrift.

RICHARD J. BENNETT, J. M. D.

DeWitt and Nippel, P. It. Clinical Aspects and Treatment of Cutaneous Cancer. *J. M. A. G. O. R. G.* 945:34, 5.

The death rate from skin cancers and the metastases is comparatively high and frequently the physical condition of the patient is so poor that the basal malignancy is almost fatal. Early diagnosis is essential for the treatment of the skin cancer. The patient should be treated by the patient because the skin cancer is not a disease of the skin, but a disease of the body. The patient should be treated by the patient because the skin cancer is not a disease of the skin, but a disease of the body.

The physical condition of the patient is so poor that the basal malignancy is almost fatal. Early diagnosis is essential for the treatment of the skin cancer. The patient should be treated by the patient because the skin cancer is not a disease of the skin, but a disease of the body.

Excluding melanomas, the skin cancers may be placed into two general types: the basal cell carcinoma and the squamous cell carcinoma. While

basal cell carcinomas are common, the squamous cell carcinoma is extremely rare in the basal cell carcinoma.

Basal cell carcinoma may cure the skin cancer but also cause unsightly deformity. Overzealous roentgen therapy may result in radiation skin cancer. Squamous cell carcinomas may develop in sites of a radiation dermatitis. These carcinomas must be removed surgically. Surgical treatment is required for skin cancer, but the skin cancer is not a disease of the skin, but a disease of the body.

In such diseases as xeroderma pigmentosa, actinic keratosis, and atrophic dermatitis, a squamous cell carcinoma is also common. Surgery is also recommended in epidermoid carcinoma, which arises in the form of scars from burns. These scars consist of fibrous and relatively avascular tissue and the tumors arising in these areas are not radiosensitive.

The author shares the experience of others that roentgen therapy has no advantage over roentgen ray therapy in skin cancer. Radiation is more convenient and for this reason more efficacious when the disease is located in inaccessible locations such as the eyelids, tongue, and mucosa.

Three hundred and four patients with skin cancer were treated and observed by the authors for one or more years. Of the patients, 91 had squamous cell carcinomas (3 per cent) and 23 had basal cell carcinomas (70 per cent). Only early cases of squamous cell carcinoma were treated.

Cures were obtained in 97.7 per cent of the basal cell carcinomas and in 84.6 per cent of the squamous cell carcinomas. In the great majority of the cases the authors used surgical procedure or electrocoagulation with curettage. This was followed by roentgen ray radiation in a few selected cases by radium irradiation. With this combination of methods, they obtained a high percentage of cures and also good cosmetic results.

JOHN E. NAR, M.D.

GENERAL BACTERIAL PROTOZOAN AND PARASITIC INFECTIONS

Engelhorn, T. D. and Williams, W. E. Filariasis in the Islands of the South Pacific. *Am. J. M. S.* 945:99, 41.

The clinical picture of early filariasis as based on bacteriologic material made on 127 American soldiers. The incubation period of filariasis as determined from the symptom varied from three to five months. Early symptoms were eu-lagnosia and edema of the face, vomiting, and variable pains especially in the gonorrheic cord test lesions and thigh. Within from ten to fourty days of the first symptom, the patient developed a fever, a prothrombin time of 75 per cent of the older, acute pyridium and functional liver enzyme test findings. The color could be palpated and found to be from two to five times the normal size. Hydrocele was not observed. In the treatment of the patient, lymph nodes were less effective. The course of the disease was usually fatal with superficial gland nodes, the more distal nodes. Only a solid developed bases. These

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It appears to be paid. It is eliminated readily by the incineration of single doses being excreted within one or two hours. The remainder is apparently destroyed in the body. Penicillin is practically innocuous when used as recommended.

Rigid standardization of doses should be avoided. The individual patient should be treated according to his needs. Strenuous treatment for a short interval is preferable to small doses over an extended period. Doses ranging from 60,000 to 360,000 units in a twenty-four hour period have been found to be satisfactory for the control of most infectious processes. Three methods of administration have been used: continuous intravenous drip, intramuscular injection and continuous intramuscular drip. For topical application, penicillin has been dissolved in saline solution to a concentration of from 1 to 500 units per cubic centimeter. Ointment base has also been used. 500 units per gram of base.

With the use of penicillin drainage of pyogenic collections can safely be delayed until the patient is in ideal condition. The inhibition of metastatic emigration or septicemia is a major indication for penicillin therapy. Established local pyogenic processes are usually halted and the total area of involvement is held to a minimum. The flora of abscesses is often changed by penicillin therapy so that with mixed infections the more dangerous cocci are frequently limited. The danger of dissemination at the time of surgical intervention is greatly reduced by the use of penicillin. This allows the after performance of more radical procedures than were formerly possible. The use of penicillin parenterally and topically often permits the use of conservative surgical techniques which previously were unsatisfactory.

Stricter attention to the daily caloric potential and vitamin intake of patients with infectious diseases greatly augments the effectiveness of penicillin therapy. In order to realize fully the potentialities of penicillin treatment, advantage should be taken of all necessary and supportive adjuvant therapy. Diseases which respond well to penicillin often respond better.

A detailed report of the effectiveness of penicillin in the various infectious diseases is given by S. M. K. and H. M. D.

W. F. H. M. B. and Cutting, W. C. A Simple Technique for the Estimation of Penicillin in the Blood and Other Body Fluid. *J. Lab. Clin. Med.* 1945, 3, 6.

A simplification of Fleming's method for the estimation of penicillin is described.

Eight small Waring tests are set up in a suitable rack. In each except the first, a physiological salt solution is placed. In the first, a definite amount of the unknown whole extract of blood is added. From the control, 0.2 cc. of a 1% solution of the third tube is transferred to the fourth, 0.2 cc. retained, and the fifth tube added to make a serial dilution. 0.2 cc. of the standard is added to the last tube.

Each of the 8 tubes is added 0.2 cc. of a suspension of benzyltyrosine penicillin in broth prepared as follows:

Staphylococcus aureus, a twenty-four hour culture in broth, are transferred by loop to fresh broth. One loopful of the culture is added to each cubic centimeter of broth and enough of the suspension is prepared to make a series of all the unknown and control blood samples to be examined.

Each tube is shaken and then when it is almost horizontal, a glass capillary tube about 6 cm. long is filled by capillary action from it. While the capillary tube is still being held, the end is embedded in a small ball of modeling clay to fill a groove in a small board. When all the capillary tubes are in place in a row, the board is turned so that the tubes are upright.

After incubation for twenty-four hours at 37°C, the tubes are inspected for the presence of hemolysis. A definite line of staphylococcus is observed.

The controls are series of tubes as for the unknown blood are set up, but defibrinated horse blood contains 1 g. unit of penicillin per cubic centimeter, is used in place of the unknown blood sample.

The most dilute capillary tube which shows hemolysis and bactericidal action indicates the dilution of 1 unit of penicillin which will inhibit the inoculum of staphylococcus. The preceding tube indicates the dilution of 0.5 unit which will inhibit the streptococcus and so forth. By comparison of the end point in the control series and that in the unknown series, the concentration of penicillin in the latter is estimated. Thus if the end point in the control series is in the 1st tube, as it usually is, the unknown contains unitful amounts as the end point in the 5th tube, 0.5 unitful at the end point in the 5th tube and so forth.

The concentration of penicillin in other body fluids may be determined similarly. Urine must be diluted before the estimation to bring the usually high urinary penicillin level into the range of the blood levels. Urine is usually diluted with 9 parts of distilled water. Blood is diluted with 9 parts of distilled water. The end point is then determined only on the basis of color growth. The final values must be corrected for the dilution factor. SAMUEL KARN, M.D.

Galla, D. E. The Sensitivity of Bacteria from Infected Wounds to Penicillin. *R. S. J. Clin. Med.* 1945, 7, 20.

Strains of staphylococcus from 22 cases of traumatic wound of the extremities and sections of tissue for duration of more than 1 year which had been treated with one or more of the sulfonamide drugs prior to admission to the hospital were subjected to study by a method described in a preliminary report by the author (Sensitivity of Bacteria from Infected Wounds to Penicillin. *Method of Assay*. *War Med. Clin.* 1944, 6, 86). No constant relationship was discoverable between the factor of pathogenicity as disclosed by the coagulase test and the factor of resistance to penicillin.

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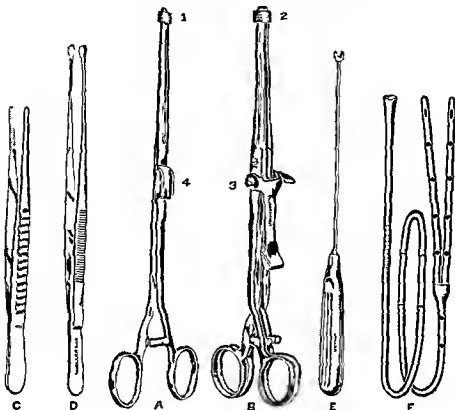
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Instruments for Aseptic Gastric Resection

BY OWEN H. WANGENSTEEN M.D. F.A.C.S.



(A) WANGENSTEEN A. ast. mo. Cl. mp. ar. ad. pt. bl. t. t. d. ast. mos. (d. lo. e. d. e. d. to. d. de. to. d.) n. a. v. p. t. n. f. th. l. me. t. y. nal. es. ph. a. st. m. ch. mall. l. ge. ntest. C. n. t. f. tw. p. at. d. tal. f. ps. bo. t. ll. hes. l. gth. h. ld. t. g. th. f. des. d. by. pe. al. lock. g. d. t. h. f. d. tag. les. th. t. t. f. p. ar. man. p. ult. d. a. p. t. at. m. t. f. th. post. r. p. t. f. tl. a. n. t. m. b. t. l. k. dt. th. a. n. st. m. t. f. pl. m. nt. of. th. t. w. f. t. es. Sel. l. k. gh. nd. es. p. d. a. f. han. ll. pe. t. th. f. a. a. m. bl. d. type. cl. mp. A. f. r. r. u. l. o. th. distal. l. f. f. cep. a. es. ur. t. pt. t. f. th. l. n. t. al. groo. es. d. m. t. p. es. al. al. g. th. th. bl. des. Ch. om. pl. t. d. Set. ft. \$39.50

(C) WANGENSTEEN S. l. s. t. H. ld. g. F. ps.

A. f. e. h. th. m. f. ps. th. fi. ly. e. t. l. j. Chr. m. pl. t. d. E. h. \$2.25

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(E) WANGENSTEEN S. t. I. t. A. l. g. l. d. at. m. t. f. r. r. g. l. g. t. d. t. d. p. ly. g. < t. Chr. m. pl. t. l. (R. l. f. d. l. y. oo.)

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THE FALLACY OF SURGICAL GUT (CATGUT) TUBING FLUID AS A TISSUE IRRITANT

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IT is estimated that fully 80 per cent of surgeons in America today use catgut exclusively as their suture material and while the remainder use silk or some other nonabsorbable material they usually employ catgut whenever silk is contraindicated. More over in wounds which are or may become contaminated catgut is the overwhelming choice with practically all surgeons.

TISSUE REACTION

The character of cell reaction against any suture where the patient's capacity to respond is within normal limits is identical: an initial polymorphonuclear infiltration is followed by the presence of more mature mononuclear cells and then by fibroblasts. This cell reaction implies an attempt to dissolve, digest, absorb, get rid of something which is not meant to be a part of the human body. The cellular reaction from the time the suture is embedded until its complete disappearance varies little from the reaction of the protective mechanism when combating bacterial invasion. In the case of catgut the reaction is acute and absorption of the strand is rapid in the case of silk or cotton it is prolonged. The initial attempts at removal of nonab-

sorbable sutures are the same as with catgut but in the case of silk the phagocytic cells are confronted with the problem of digesting one of the most resistant fibers. Unable to do otherwise they quarantine the undesirable strand in a capsule of fibroconnective tissue. To epitomize catgut strands plain or chromic silk or cotton twisted or braided all produce cell reactions which are similar in character in the first few days after being embedded in normal tissue. The degree of this reaction however varies with the resistance of the patient and the nature of the suture strand.

In 1940 I presented evidence (2) in the case of catgut which showed that regardless of anything else such as method of processing or the tubing fluid used the quantity of suture material is the chief cause of tissue reaction. Gross and microscopic sections showing the minimal tissue reaction accompanying the embedding of fine size catgut as compared with the larger sizes were presented. The tremendous increase in the use of the smaller sizes of catgut would seem to indicate that surgeons have proved this point to their own satisfaction.

PURPOSE OF INVESTIGATION

Recently the attention of the surgical profession has been directed to the subject of tub-

1. In the case of catgut, the reaction is acute and absorption is rapid. In the case of silk or cotton, the reaction is prolonged. The initial attempts at removal of nonabsorbable sutures are the same as with catgut but in the case of silk the phagocytic cells are confronted with the problem of digesting one of the most resistant fibers. Unable to do otherwise they quarantine the undesirable strand in a capsule of fibroconnective tissue. To epitomize catgut strands plain or chromic silk or cotton twisted or braided all produce cell reactions which are similar in character in the first few days after being embedded in normal tissue. The degree of this reaction however varies with the resistance of the patient and the nature of the suture strand.

ing fluid (4 5 6 7) and the claim has been made that certain fluids are responsible for the rather marked tissue reaction sometimes provoked by surgical gut sutures. Not having encountered tissue reaction of the type described my interest in sutures prompted a series of animal experiments to procure additional information on the subject of catgut tubing fluid and to establish definitely the part that tubing fluid plays in tissue reaction.

MATERIALS

In the experimental work reported by Dunham and Jenkins (4 6) it was stated that the amount of water insoluble hydrocarbon (hi flash solvent) present in alcoholic tubing fluid of most nonboilable surgical gut products has ranged from a trace up to as high as 10 per cent in some products while in one product it ranged from 6 to 14 per cent. Through the cooperation of one of the larger catgut manufacturers a series of nonboilable catgut sutures was prepared, tubed in ethyl alcohol containing percentages of hi flash solvent ranging from 0.1 per cent up through 1 per cent 2.5 per cent 4 per cent 10 per cent and 15 per cent.

The suture material consisted of medium chromic catgut size No. 000 which is relatively small and therefore the possibility of tissue reaction caused by a large amount of foreign protein was eliminated. Dunham and Jenkins (4 6) used this size in their experiments and further medium chromic catgut was used in order to minimize tissue reaction caused by the suture material itself. Inasmuch as Bates (1) has demonstrated that plain catgut excites a greater exudative response in the tissue than does medium chromic catgut

SPECIES OF ANIMALS

Series I. Fifteen rabbits and a similar number of dogs were used. The rabbits were of more than 4 pound average weight. Dogs were used also because their tissue reaction to sutures and the anatomical structure of their stomach closely resemble that of man. In a dog weighing 44 pounds the stomach is similar in structure, blood supply and acid content to that of man. Vitamin metabolic and blood studies were conducted on the dogs

for a period of approximately 2 months at the end of which time the animals were divided into three groups.

Group 1. This group was composed of healthy dogs that had received a balanced diet with hemoglobin content, erythrocyte and leucocyte count, blood chemistry, vitamin C content and kidney function within normal limits. Their average weight was 25 pounds.

Group 2. In this group were dogs with a reduced blood volume but still healthy, average weight being 33 pounds. They had received a balanced diet, hemoglobin and vitamin C content, erythrocyte and leucocyte count, blood chemistry and kidney function had been determined. Anesthesia was induced by the intraperitoneal injection of sodium pentobarbital. The internal jugular vein was cannulized and enough blood was removed to reduce the blood pressure to 70 millimeters of mercury. This blood pressure was maintained for 30 minutes by the withdrawal when necessary of a sufficient amount of blood. A special colloidal solution of hemoglobin was then injected in sufficient quantity to bring the blood pressure to within prehemorrhage level and the studies made prior to operation were repeated. The animals were then permitted to recover and at varying periods of time blood studies were repeated.

In some of these animals sutures were implanted within a few days after blood replacement. While they had recovered from shock, their total hemoglobin, as well as the red cell count, was reduced, the vitamin C content, however, was within normal limits. The results of the implantation of No. 000 chromic catgut are shown in Figure 3 and 4.

Group 3. In this group were dogs in a state of malnutrition. Some had been operated on previously. Despite the fact that an attempt was made to improve their physical state, their appetites were not good and they had continued to lose weight which averaged 10 pounds at operation. Their hemoglobin content, erythrocyte and leucocyte count were about 50 per cent of normal and the vitamin C content had been reduced 25 per cent.

The results of implantation of No. 000 chromic sutures in the stomachs of these dogs

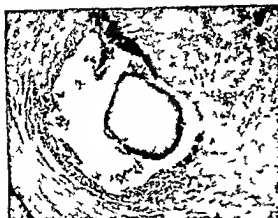


Fig. 1. S. b. t. d. g. T. ta. h. tg. t. 100x. edf. t. m. h. t. d. f. s. d. vs. Th. t. h. i. b. e. t. l. e. d. thyl. l. h. l. f. h. ch. ll. t. f. h. d. l. h. sol. i. h. d. be. m. d. L. ocyt. t. l. t. g. t. tha. in. t. sect. X60.

Fig. 2. S. l. t. d. g. T. t. i. g. h. tg. t. 100x. edf. th. st. m. h. t. th. d. l. s. Th. tu. h. d. be. t. bed. thyl. l. h. l. t. n. g. s. pe. t. f. f. h. l. t. L. ocyt. f. l. t. m. m. l. C. mp. d. Fg. X60.

are shown in Figures 1 and 2. Five day specimens were selected because of the maximal tissue reaction usually present at this time.

EXPERIMENTAL METHODS

Series 1. The rabbits were anesthetized by intravenous sodium pentobarbital. Aseptic technique was used. Midvertical epigastric incisions were made. The sutures saturated with the tubing fluid were embedded beneath

the serosa of the anterior gastric wall immediately after removal from the glass tubes. As a control I used medium chromic catgut sutures tubed in ethyl alcohol from which all trace of histiolytic solvent was removed. The animals were sacrificed on the 5th, 10th and 20th days and blocks of tissue were removed.

Microscopic examination showed a minimal degree of tissue reaction in all animals. The degree of tissue reaction produced by sutures

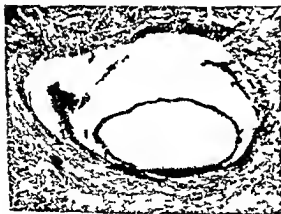
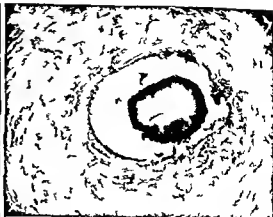


Fig. 3. Sh. x. k. d. ed. d. g. T. cu. e. h. 100x. ret. edf. th. t. h. t. h. l. f. l. s. Sh. x. k. h. l. l. e. i. ed. l. th. l. f. 3. pe. t. f. blood. l. ur. (see. f. toc. l. T. t. h. l. bee. t. bed. th. l. l. h. l. fro. h. h. ll. f. h. h. u. l. e. t. h. l. bee. ed. Le. t. l. rat. gre. tha. f. ll. g. sect. X60.

Fig. 4. h. o. c. k. ed. dog. T. ta. i. g. h. catgut. 100x. edf. th. t. h. t. th. l. f. d. ys. Sh. x. k. l. d. bee. d. ed. l. y. th. l. 3. pe. t. f. l. l. o. d. l. (see. p. t. e. l. Th. t. f. had. bee. t. bed. t. thyl. l. h. l. ta. g. pe. t. f. h. u. l. h. sol. t. Le. ocyt. f. l. rat. bee. t. C. f. th. l. g. 3. X60.



F 6 N mal d g T es t g h t g t
 N o o o m d f m t m h t t h d f d y
 Th t h d b t b e d t h y l f h l f m h a c h l l
 tr f h f h s o l t h d b e m e d L o c y t
 h l t u m l d - d o r f f i b l e s t h f g u
 6 X 3

F 6 N mal d g T es t g h t g t
 N o o o m d f m t m h t t h d f d y
 Th t h d b t b e d t h y l f h l f m h a c h l l
 pe t f h f h s o l t L o c y t f i l t t t h
 p m m m m t - f i b b l t e s p o l l i
 X 60

which had been in tubing fluids containing varying degrees of hi flash solvent was no greater than that caused by the control sutures tubed in alcohol from which all trace of the solvent had been removed.

Based on the results of these experiments it seemed as if some other factors not taken into consideration might account for the difference in these results as compared with those reported by Dunham and Jenkins (4, 6). Therefore it was decided to conduct a second series of experiments using a similar set of sutures and tubing fluid.

Series. For this second series of experiments however dogs were used exclusively for the reasons stated. Moreover in the experiments reported by Dunham and Jenkins dog were employed. In order to remove all possible factors which might account for the difference in results between their experiments and mine dog were selected on which vitamin metabolic and blood studies had been conducted so that each animal's physical condition was known. Ether anesthesia was employed. The abdomen of each animal was prepared by shaving and washing with alcohol. Aseptic technique was used throughout. A midvertical epigastric incision was made the edges of the incision were protected with sterile drape and the dog's stomach was delivered. The sutures to be tested were placed

vertically beneath the serosa in the anterior gastric wall immediately after removal from the glass tubes so that the sutures were saturated with the tubing fluid and exposed to the air less than 1 minute. Both ends of the suture were marked with a single interrupted black silk suture. The animals were given water at the end of 24 hours soft mash in moderate quantity at the end of 48 hours and regular diet after 72 hours. The wound healed normally without exception. The animal were sacrificed on the 5th, 10th and 20th days and sections of the stomach were removed for microscopic study. At autopsy the gross appearance of all the dogs' stomachs was similar.

DISCUSSION

Experimental work (2, 3) reported in 1940 and 1942 gave an accurate estimate of the comparative degree of tissue reaction following the embedding of catgut strands of varying character and it proved the value of a study of the gross and microscopic changes. It can be assumed that the mechanism designed to dispose of the foreign body (suture) would of necessity first attack the exterior coating which in this instance would be the tubing fluid and that the disintegrating action once begun would continue until completed.



Fig 7 \ m l d g T s t g h m t g t
 \ o o o m e d f t h t h t h d f
 d y Th t h d b e t b e d t h y l l h l t
 g 4 p e t f h f l a h s o l t L e o c y t e f l t
 m | F b b l t e q s e s a l f t r y X60

Fig 8 \ m l d g T s t g h m t g t
 \ o o o m e d f t h t h t h d f
 d y s Th t h d b e t b e d t h y l l h l e t
 g p e t f h f l a h s o l t L e o c y t e f l t
 n m l F b b l t p o c e l l t X60

A review of the microscopic changes observed in the accompanying photomicrograph shows that this actually occurs. Polymorphonuclear infiltration occurs first and is greatest in the 5 day specimen regardless of whether hi flash solvent was present in the tubing fluid—in fact it is greatest in those specimens containing the control sutures whose tubing fluid did not contain any hi flash solvent (Fig. 1).

In 10 day specimens the tissue reaction was consistently less than in the 5 day specimens regardless of the amount of hi flash solvent in the tubing fluid. In the 20 day specimen the tissue reaction was still less than in the 10 day specimens.

These results lend no basis whatever to the claim made by Dunham and Jenkins. The magnitude of irritant action which in some respects was rather excessive was proportional to the amount of water in soluble liquid (hi flash solvent) in the alcoholic tubing fluid. As already mentioned the tissue reaction was not related to the amount of hi flash solvent in the tubing fluid. In fact the minimal degree of tissue reaction occurred with sutures tubed in ethyl alcohol which contained a high percentage of hi flash solvent (Fig. 8).

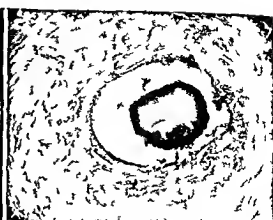
If then the tubing fluid is not the cause of the intense tissue reaction described by Dunham and Jenkins (4, 6) what is? If the tubing

fluid has been absorbed and disposed of early then the only material remaining which could call out a leucocytic response of such intensity is the catgut strand itself and the chemicals which were incorporated in it during the processing.

As previously mentioned whether it be catgut silk or cotton leucocytes attack the suture and attempt to dispose of it as long as it remains in the body. Figures 15 and 16 show cross sections of size No. 0 silk tubed in xylene which were removed from rabbits at the end of 14 days. The low power lens (X60) shows absence of leucocytic infiltration at the periphery. The high power (X260) shows leucocytes surrounding the individual fibers. This is further evidence that the strand itself and not the tubing fluid is the cause of the tissue reaction.

The microscopic sections are presented in three groups. Group 1 normal dog 10 day and 20 day. Group 2 convalescent partially exsanguinated dogs—similar to patient operated on in shock that ectopic pregnancy or bleeding duodenal ulcer 10 day and 20 day. Group 3 scorbutic dogs 5 day and 10 day.

The first two groups of photomicrographs show very little difference in tissue reaction. The tissues of most animals and thus includes man as well as the dog heal normally in the presence of a reduced blood volume. Photo



F \ m l d g T t g h m t g t
 \ o o o w s m d f m t m h t t h d f d y
 Th t h d b t b d thyl l h l f m h h l l
 t f h f h s l t h d b m d L cyt
 f l t t m l d - d g f f b j t h F g u
 6 X 3

F g 6 \ m a l d g T t g h m t g t
 \ o o o a m d f r m t m h t t h d f d y
 Th t h d b t b d thyl l h l f m h h l l
 p c t f h f h l t L cyt f l t t th
 p m m a l - f l b l t j
 X 6

which had been in tubing fluids containing varying degrees of hydroalcoholic solvent was no greater than that caused by the control sutures tubed in alcohol from which all trace of the solvent had been removed.

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Fig 7 \ 1 dg T t g h catgut
 \ 000 ed f m th t m h t th d f
 d ys Th t h d be t bel thyl h l la
 g 4 pe t f h fl h sol t L ocyt flt t
 l j b bl t r pouse t f t y X60

Fig 8 \ 1 dg T t g h catgut
 \ 000 ed f m th t m h t th d f
 d ys Th t h d b t bed thyl h l t
 g pe t f h fl h sol t L ocyt flt t
 l f b bl t r po c ll t X60

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Fig. 9. N. m. l. d. T. a. s. ta. g. h. t. g. t. ut. N. o. o. w. m. d. f. m. th. t. h. t. b. d. f. d. y. s. Th. t. h. d. b. e. t. b. d. thyl. l. h. f. m. h. ch. ll. tra. f. h. fl. h. sol. t. h. d. b. r. m. d. Le. o. cyt. flt. t. m. m. l. F. b. bl. t. f. r. m. t. w. ll. d. ed. X60

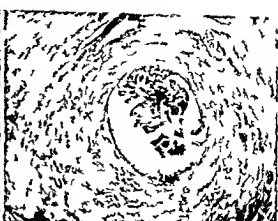


Fig. 9. N. m. l. d. T. a. s. ta. g. h. t. g. t. ut. N. o. o. w. m. d. f. m. th. t. h. t. b. d. f. d. y. s. Th. t. h. d. b. e. t. b. d. thyl. l. h. f. m. h. ch. ll. tra. f. h. fl. h. sol. t. h. d. b. r. m. d. Le. o. cyt. flt. t. m. m. l. F. b. bl. t. f. r. m. t. w. ll. d. ed. X60

micrographs of both 10 day and 0 day specimens show this clearly the degree of tissue reaction and absorption of the strand are almost identical. In the third group the scorbutic dogs the 10 day specimen shows very little difference from that of the normal animal.

The photomicrographs are presented with a low magnification because examination of the entire section is necessary to draw any accurate conclusions.

Ethyl and isopropyl alcohols There is a very pertinent matter mentioned by Dunham and Jenkins (4) concerning the nature of the alcoholic tubing fluid. They reported that some manufacturers employ tubing fluid containing isopropyl alcohol for nonboilable surgical gut while others use ethyl alcohol. It seemed important in this study to investigate these two alcohols for use as tubing fluid. A third series of animal experiments were carried out in which cotton sutures sterilized



Fig. 10. C. t. t. d. N. t. b. d. thyl. l. h. f. m. th. t. h. t. b. d. f. d. y. s. Th. t. h. d. b. e. t. b. d. thyl. l. h. f. m. h. ch. ll. tra. f. h. fl. h. sol. t. h. d. b. r. m. d. Le. o. cyt. flt. t. m. m. l. F. b. bl. t. f. r. m. t. w. ll. d. ed. X60

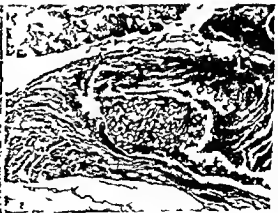


Fig. 10. C. t. t. d. N. t. b. d. thyl. l. h. f. m. th. t. h. t. b. d. f. d. y. s. Th. t. h. d. b. e. t. b. d. thyl. l. h. f. m. h. ch. ll. tra. f. h. fl. h. sol. t. h. d. b. r. m. d. Le. o. cyt. flt. t. m. m. l. F. b. bl. t. f. r. m. t. w. ll. d. ed. X60



Fig. 3 Ch m t gut N ooo t bed yl
ll ed be t se ooa f lbt t h d t t m t be
-t l g fl l t hed fl T ta g ig t
t d m l ft s d y I ocyt flt t
l X60

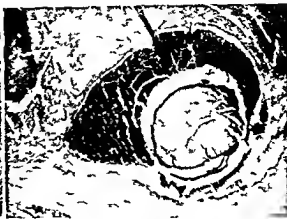


Fig. 4 Ch m t g t N ooo t liz d d y th t
t b g fl d pl ced be th s r sa f bl t t b
Ti ta g tg t st l m d aft s l ys
Ie ocyt filtrat n k l-leg s b r t f
t d X60

in each of these alcohol were used to determine the effect of each.

Series 3 Fifteen rabbits were used. The average weight of the animal was over 4 1/2 pounds. Anesthesia was induced by intravenous sodium pentobarbital. Aseptic technique was used throughout. The sutures were embedded in the anterior abdominal wall beneath the sheath of the rectus muscles immediately after removal from the tubes so that they were still saturated with the tubing fluid. The animal were sacrificed at intervals of 1, 3, and 5 days and microscopic

studies of blocks of tissue showed that the degree of tissue reaction induced by the sutures tubed in isopropyl alcohol was at least twice as great as that produced by the sutures tubed in ethyl alcohol (Figs. 11 and 12).

Xylene tubing fluid Dunham and Jenkins (4) reported that xylene used as a tubing fluid for the boilable type of surgical gut is a potent tissue irritant and in some tissues becomes a necrosing agent. They stated that if manufacturers are unable to provide an anhydrous liquid for boilable surgical gut which is harmless to tissues it would appear appropriate



Fig. 5 Ch m t g t N ooo t bed yl Lm
bed l l th t h f t t t t
l re ed ft d d y N t se fl
t t t t p e l s X60

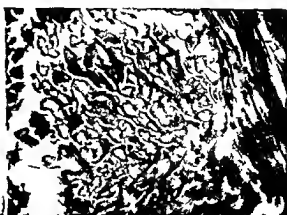


Fig. 6 H gh po m gn f ti f F gur N t
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to suggest marketing boilable products without any tubing fluid. For the purpose of comparing tissue reactions produced by surgical gut tubed in xylene and surgical gut sealed in tubes without any tubing fluid I conducted a fourth series of animal experiments. Medium chromic catgut size No. 000 was used, some of the sutures being tubed in xylene and sterilized after the usual manner of preparing boilable surgical gut while the remaining suture were placed in dry tubes the tubes sealed and sterilized.

Series 4. Thirty healthy rabbits whose average weight was over $4\frac{1}{2}$ pounds were used for the tests. Anesthesia was induced by intravenous sodium pentobarbital and a eptic technique used throughout. Midvertical epigastric incisions were made and the sutures embedded beneath the gastric serosa. In one group of animal the sutures were embedded in the tissues directly as they came from the glass tubes so that the sutures tubed in xylene carried the anhydrous liquid directly into the tissues. In the other group of animal the sutures were first immersed in warm sterile water before being embedded in the tissues so that the xylene on the surface of the strand was removed. This procedure also served to soften the dry sterilized suture and thus lessen tissue trauma. The animal were sacrificed on the 1st, 3d and 5th days and blocks of tissue were removed for microscopic examination.

A study of the specimens showed that in both groups of animal the degree of tissue reaction as shown by polymorphonuclear infiltration was from 50 per cent to 300 per cent greater around the sutures that were sterilized dry in the tube than around the sutures that were tubed in xylene (Figs. 13 and 14). The explanation of these results lies in the fact that when sutures are sterilized dry a small quantity of a mixture of fat and fatty acid remains in the suture and acts as a tissue irritant. However when the sutures are sterilized in xylene this hydrocarbon extracts the mixture of fat and fatty acid and the fatty extract remains in the tubing fluid in the tube. From this series of experiments it is clearly evident that xylene as a tubing fluid does not produce tissue irritation. Like-

wise it is equally evident that it is not practical to market boilable surgical gut dry because of the excessive degree of tissue irritation induced by dry sterilized gut.

To further investigate the possible irritant effect of xylene on the tissues I conducted a fifth series of animal experiments.

Series 5. Three rabbits each weighing over $4\frac{1}{2}$ pounds were used. Each was anesthetized by means of intravenous sodium pentobarbital. The abdomen was shaved and prepared aseptically and a midvertical epigastric incision was made. To the stomach with attached omentum and the contiguous small and large intestines pure xylene was liberally applied by means of sterile cotton swabs. The incision was then closed. The animal were sacrificed on the 3d postoperative day. All 3 showed complete absence of tissue irritation—there was no free peritoneal fluid, no dilatation of the superficial vessels, no adhesions. The accompanying reproduction in colors was made from a photograph taken after the autopsy.

CONCLUSIONS

1. The animal experiments herein reported. Series 1 and 2 demonstrate that nonboilable catgut tubing fluid consisting of 95 per cent ethyl alcohol containing various percentages of hydroflash solvent does not produce excessive tissue reaction (Fig. 2, 4, 6, 7, 8).

2. Regardless of whether or not hydroflash solvent was present in the tubing fluid tissue reaction is most marked in the 1st day specimens. In fact the reaction is greatest in those specimens containing control suture the tubing fluid of which did not contain hydroflash solvent (Figs. 1 and 2).

3. These results lend no basis to the published claim of other (4) that the magnitude of irritant action which in some proportions was rather excessive was proportional to the amount of water insoluble liquid (hydroflash solvent) in the alcoholic tubing fluid. The results herein recorded show that tissue reaction is not related to the amount of hydroflash solvent in the tubing fluid.

4. In Series 3 it has been shown that the degree of tissue reaction induced by catgut suture tubed in isopropyl alcohol is almost

twice as great as that produced by sutures tubed in ethyl alcohol (Figs 11 and 12)

5 Series 4 demonstrates that the degree of tissue reaction around catgut sutures that were sterilized dry in the tubes (without any tubing fluid) was from 50 per cent to 300 per cent greater than that around sutures tubed in xylene. Not only do these experiments show that it is not practical to market catgut dry in the tubes without tubing fluid but also the fact that xylene as a tubing fluid does not produce tissue irritation (Figs 13 and 14)

6 Conclusive evidence of the rapid absorbability and lack of irritating action of xylene when brought in contact with normal animal tissue is presented in Series 5 of these experiments. A photograph in colors of the abdominal viscera of a rabbit 3 days after xylene had been liberally applied to the peritoneal surface of the stomach and the in-

testines here reproduced shows entire absence of tissue irritation—no free peritoneal fluid no dilatation of superficial vessels no adhesions

7 The results of these animal experiments demonstrate the fallacy of the claims (4-6) that catgut tubing fluids containing hi flash solvent ethyl alcohol or xylene produce excessive tissue irritation

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THECA CELL TUMORS OF THE OVARY

A Clinical and Pathologic Study of Twenty Three Cases (Including Thirteen New Cases) with a Review

EDWARD A BANNER M D d MALCOLM B DOCKERTY M D R heste M e ot

HISTORICAL DATA

Inasmuch as all major articles dealing with the subject of theca cell tumors have devoted considerable attention to historical aspects we wish to treat this phase of the subject in the light of more recent advances only. Geit and Spielman in 1935 (11) using an extract of tumor tissue confirmed the clinical observation of Melnick and Kanter (19) that theca cell tumors sometimes contain estrogenic substance in considerable amounts. Others have confirmed this observation and Traut and Butterworth (4) expressed the opinion that even though the amount of estrogenic hormone might be small its effect on the endometrium and on the breast might well be maximal because of an unopposed hormonal action inasmuch as absence of corpora lutea and presumably of progesterone has been constantly observed among patients suffering from the effects of theca cell tumors. More or less periodic postmenopausal bleeding in old women who had these neoplasms and the association observed at pathologic examination of proliferative or polypoid endometrium and fibromyomas were adduced as strong supportive evidence for hyperestrinism. Similarly interpreted was the occurrence of oligomenorrhea or amenorrhea observed in occasional cases in which theca cell tumors affected younger women. Even more suggestive was the evidence cited by Kirshbaum and others (5, 9, 23) that theca cell tumor like its close relative the granulosa cell neoplasm is sometime associated with endometrial carcinoma.

Although theca cell tumors were originally considered as luteinized fibromas—(xanthofibromas (16) and later as arising from mature theca cell of the ovarian follicle () most investigators now feel with Fischel that these

DURING the decade that has elapsed since Loeffler and Priehl (16, 17) gave the first accurate description of the ovarian neoplasm now variously known as thecoma or theca cell tumor many examples of this gynecologic newcomer have been added to the medical literature (-6, 10, 14, 19, 20). From the many excellent reviews on the subject the following observations seem pertinent: (1) Theca cell tumor of the ovary is an established entity. (2) The tumor often produces estrogen sometimes in amounts capable of influencing profoundly the physiologic processes of its host. (3) The tumor probably derives its origin from certain pluripotential mesenchymal cells of the ovarian cortex and is related on the one hand to the histologically mature fibroma and on the other to the comparatively dedifferentiated granulosa cell neoplasm. Controversy still exists however in regard to certain clinical, pathologic and physiologic aspects of the tumor and further statistical data are necessary to elucidate some of the issues. In the present report we hope to furnish some of these data in an analysis of 23 cases of theca cell tumor seen and studied at the Mayo Clinic between the year 1910 and 1944 inclusive. Ten of these cases have been previously reported by one of us (Dockerty, 5) but these cases have been re-examined in the light of recent observations in staining reactions and of chemical assays of lipid substance as applied to theca cell tumors of the ovary.

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tumors spring from ovarian cortical mesenchyma. This hypothesis has had positive support in the experimental work of Furth and Butterworth and of Geitl, Gaines and Lollack (12) who through the employment of roentgen rays were able in mice to produce both granulosa cell and theca cell tumors of the ovary. Both types appeared to have mesenchyma as their tissue of origin. This work explained among other things the strange microscopic picture of certain tumors described by various investigators who noted what seemed to be an admixture of granulosa cell and theca cell elements in the same tumor. Novak (12) went so far as to state that no distinction should be made between the two types and he suggested the term "feminizing mesenchymoma" to designate both. Inasmuch however as granulosa cell tumor sometimes occurs among children whereas no theca cell neoplasm has been described as occurring in the first decade of life most investigators favor supporting the concept that the two tumors are distinct entities.

In matters of differential diagnosis by histologic methods techniques employing the principle of silver impregnation have highlighted recent developments. According to Wolfe and Neimys (25) formation of reticulum by the theca cell is an important distinguishing feature since granulosa cell tumors apparently do not elaborate this substance. Others have reported results which are at variance with these observations and have turned for the solution of the problem to chemical and histochemical methods for determination of lipid fractions of the tumor in question. Greenblatt, Greenhill and Brown (13) found that qualitative and quantitative assay of theca cell tumors yielded values for lipid substances which were different from the corresponding values for these substances when studied from such tumors as granulosa cell neoplasm, dysgerminoma, Krukenberg tumors and ovarian fibroma. This recent phase of the problem needs further investigation.

MATERIAL AND METHODS

The material for the present study was selected from a group of more than 600 solid and semi-solid ovarian tumors seen in the division



Fig. 1. Theca cell tumor (left) and granulosa cell tumor (right) (H. E. stain, 100X).

of surgical pathology and the section on pathologic anatomy of the Mayo Clinic between the years 1910 and 1944 inclusive. All of the material used in the study had been preserved in a 10 per cent solution of formalin (4 per cent formaldehyde).

The method of approach consisted essentially of a sorting out process chiefly concerned in the beginning with certain neoplasms which had been labeled fibromas (7). Whenever any tumor was encountered which grossly or microscopically resembled the theca cell type this neoplasm was considered as a potential candidate for inclusion in the study and was further investigated. This special treatment consisted in a thorough review of the gross specimen with special reference to the shape, size, weight, color and consistency of the ovarian tumor and in examination of the contralateral ovary for signs of cessation of function as evidenced by absence of follicles and of corpora lutea, presence of atrophy with fibrosis and so forth. In those cases in which hysterectomy had already been performed careful notations were made as to the weight of the uterus, the thickness of the myometrium, the presence or absence of myomas, the thickness of the endometrium and finally the results of careful search for evidence of endometrial carcinoma. Multiple blocks of tissue were cut in each instance from the ovarian

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Fig. Theca cell tumor of the ovary. (H. & E. stain, 100X magnification)

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CLINICAL OBSERVATIONS

Incidence In our series theca cell tumor appeared to be relatively rare. It comprised about 3 per cent of the group of solid ovarian tumors, was about a third as common as granulosa cell tumor and was less than a tenth as common as ovarian fibroma.

Age The average age of patients who had theca cell tumors was about 54 years. Sixty-five per cent of the patients were 50 years of age or older. Extremes of 80 and 6 years were noted. In the literature theca cell tumors have not been reported as occurring prior to the age of puberty.

Parity Pregnancy had occurred at least once in 80 per cent of the patients.

Symptoms Irregular vaginal bleeding of the postmenopausal type or gross menstrual irregularities of younger patients existed in more than 60 per cent of the reviewed cases. Of 6 patients less than 45 years of age, 2 had experienced amenorrhea of 4½ months and 1 year respectively; one had experienced menometrorrhagia for 3 months while the remaining three had not noted any change in their menstrual rhythm. Of 12 patients 55 years of age or older, 8 had complained of postmenopausal spotting for periods varying from 10 days to 10 years. No menstrual aberrations had been recorded in 4 cases. Postmenopausal bleeding was noted in the records of 2 of the remaining 5 patients of menopausal age. In 3 cases it was impossible to ascertain whether or not the theca cell tumor had produced early amenorrhea or a delay in the onset of the climacterium. In only 1 case of the entire group did the postmenopausal bleeding assume the regularity of rhythm resembling normal menstruation.

The data in this case were briefly as follows:

The patient was 56½ years old, married, and at the age of 50 years she had experienced menorrhagia, nervousness, headaches, and flashlights. For 5 years she had been administered oral contraceptives. At the age of 52 years these menopausal symptoms had abated, and for 5 months the patient had been in excellent health. On April 1, 1951, she had experienced a vaginal spotting which gradually increased in amount and assumed a rhythmic character similar to those of her previous menstrual periods.

TABLE I—CHEMICAL COMPOSITION OF THECA CELL TUMORS

Endometrial tissue	Cholesterol	Chlorine	Lecithin	Fatty acids	Total lipids
Adenocarcinoma	8			50	3.3
Hyperplastic (proliferative)		6		6	3.6
Type III		6	77	6	6
Inf.	7	4	6	4	
Adenocarcinoma			8		7
Atrophic					6
Inf.		3	5	1	3
Percent (mean)	7.5	4.5	6.5	11.5	6.5

The bleeding occurred once a month, lasted from 3 to 5 days and was accompanied by moderate degree of discomfort in the lower part of the abdomen. The patient stated that between periods she felt stronger than she had felt for years and that she could participate in activities which up to this time of life she had found too strenuous.

Physical examination at the clinic revealed a woman in very well preserved for 56 years of age. The essential findings otherwise consisted of the presence of an egg-sized tumor in the left adnexal region and an enlarged uterus containing several nodules believed to be fibromyomas.

Preliminary dilatation and curettage were done with the removal of a large amount of endometrium. Microscopically this presented the picture of moderate proliferative and secretory phases of the menstrual cycle along with moderate cystic change. The uterus, both tubes, and both ovaries were subsequently removed. Cause of a solid yellowish tumor in the right ovary and uterine fibromyomas. Section made at the time of operation revealed the ovarian tumor to be of the theca cell type and accordingly postoperative studies for estrogen were carried out.

TABLE II—CHEMICAL COMPOSITION OF THE NORMAL OVARY

A	Cholesterol	Chlorine	Lecithin	Fatty acids	Total lipids
5	3	Trac	3.9	38	
	8	Trac		00	8
		Trac	3		58
	4	Trac	3.00		47
60		T	56		3
33	36	3	4.3	7	4.43
5		Trac	56	70	

TABLE III.—CASES OF THECA CELL TUMOR PERTINENT DATA

Case	Age yrs	Paty	Menstrual	Duration	Site	Size	Myomym	Endometrium
		Primipara	Pain rt. lower abdominal quadrants. Dysmenorrhea	5 yrs 5 mo.	Right	5 cm diam	Thin end Fibromyomas present	Proflera ve
5		T para	Blood vaginal discharge (yrs postmenopausal)	yrs	Right	6x4x3 cm	Fibromyomas present	Proflera ve
60		Sep para	Bloody vaginal discharge (yrs postmenopausal)	12	Left	6x5x5 m (cm)	Fibromyomas present	Polypoid, colicve
6		T para	Intermittent vaginal bleeding (yrs postmenopausal)	yrs	Right	4x3 cm	Thick d	Adenocarcinoma (d diffuse) fundus
3		Nullipara	Menometrorrhagia	mos.	Right	3 cm	Thick end Fibromyomas present	Endometrial secretory
6		T para	Abdominal tumor (yrs postmenopausal)	7	Right	3 mm diam	Fibromyomas present	Atrophic
7		Primipara	Vaginal bleeding	4 yrs	Left	cm diam	Fibromyomas present	Stagnant blood in uterus
8		Nullipara (Seagravida)	Falling fibroid (20 yrs postmenopausal)	0-1 yrs.	Left	4x2x2 cm.	Thick dense knot	Polypoid, colicve
		Nullipara	Fibroid tumor	12	Right	3.5 cm	Fibromyomas present	Atrophic
6		Nullipara	Recurrent menorrhagia	4 yrs	Right		Fibromyomas present	Polypoid, colicve (d diffuse)
		Secundipara	Negative findings (20 yrs ago)		Right	3 m diam	Fibromyomas present	Polypoid, colicve
6		Secundipara	Negative findings (menopausal)		Right	2 mm diam	Fibromyomas present	Polypoid
		T para	Menorrhagia. Abdominal distension	mos. mos.	Right	3x2 m	Thick d	Leucoplakia
		Nullipara	Postmenopausal bleeding	yrs	Left	m	Thick d. Fibromyomas present	Hypertrophic
		T para	Vaginal bleeding	m	Right	5x2x2 cm.	Thick d	Gross inflammation
6		Nullipara	Proctocolic findings (5 yrs postmenopausal)		Right	3x2.5 cm	Atrophic	Atrophic
7	80	Quadripara	Atrophic findings		Right	cm diam	Thick d	Adenocarcinoma with metastases
26		Primipara	Amniotic band	yr	Right	4x3 cm	Thick d	Fibromyomas present
6		Nullipara	Vaginal bleeding (yrs postmenopausal)	days	Left	3x2x2 m	Thick d. Fibromyomas present	Hypertrophic
20	6	Quadripara	Abdominal pains (6 yrs postmenopausal)	12	Left	6 cm diam	Fibromyomas present	Polypoid, colicve
		Nullipara	Vaginal bleeding	yr	Left	4x3 cm	Atrophic	Atrophic
		Nullipara	Dull lower abdominal pain, intermittent	yr	Right	cm diam	Fibromyomas present	Leucoplakia
3	6	Nullipara?	Vaginal bleeding	yr	Left	2x2 cm	Fibromyomas present	Adenocarcinoma

on the patient's urine the method outlined in a for each paragraph being used. Blocks of fresh tissue were similarly secured. In both instances in preparation of the postoperative history and the evidence of estrogenic activity afforded by examination

of the endometrium the results of the following were disappointingly not predicted as being negative.

Among the other 22 patients outside of the aforementioned symptoms there were no other

plaints that were not compatible with the presence of any slowly growing pelvic tumor. However a triad of symptoms namely menstrual disturbances pelvic pain and pelvic tumor were observed to occur fairly constantly (Table III). Semiperiodic postmenopausal bleeding appeared to be the only reasonably specific symptom from a clinical standpoint.

Positive findings on physical examination were limited for the most part to the demonstration of a firm adnexal tumor and the frequent association of uterine leiomyomas or of an enlarged uterus. In 1 case a cervical carcinoma was visualized on speculum examination and in 2 cases carcinoma of the fundus was suspected on the basis of a clinical history of regular postmenopausal bleeding combined with the finding on bimanual pelvic examination of a boggy uterus. In one case the presence of a citic fluid was ascertained clinically. No mammary hypertrophy of notable degree was observed in any of the cases in our study.

PATHOLOGIC DATA

Site. The right ovary was the seat of the tumor in 15 and the left in 8 cases. No instance of bilateral tumor was encountered in the series.

Size. The largest tumor measured 12 centimeters in its greatest diameter and the smallest 3 millimeters. The average diameter was about 6 centimeters, the actual size of the tumor bearing no apparent direct relation to the degree of clinical function as measured by the duration or the severity of associated menstrual disturbances.

Color consistency and so forth. The color of the tumors varied considerably. The outer aspect usually smooth and often bosselated presented tints ranging from brownish gray or even pearly to a dull orange yellow. This latter color was nearly always apparent somewhere on cut section of the tumor. The consistency was in general firm but rubbery rather than evenly hard and inelastic. Degenerative central cysts were present in several of the larger tumors and these cysts appeared to arise through chronic infarction and edema as the result of twisting of the pedicle of the tumor.

Residual ovarian tissue could be found in the capsules of all but the larger neoplasms. A smooth glistening capsule invested all but two of the tumors and these two appeared to be fixed by adhesions to neighboring structures. Ascites was produced by one large theca cell tumor and its presence was interpreted in the light of weeping edema as postulated for similar findings associated with ovarian fibroma. (7) No examples of Meigs's syndrome were encountered.

Microscopic features. The histologic features of theca cell tumor as seen in frozen and paraffin sections stained with hematoxylin and eosin are well known and in our typical cases there was nothing new to add. In 4 cases examination of the tumor while for the most part revealing ordinary theca cells demonstrated in many areas the cytologic characteristics and cellular arrangement of granulosa cell neoplasm. One of these has been illustrated in a previous article by one of us (Dockerty 5). In these preparations employment of the principle of silver impregnation for the demonstration of reticulum fibrils revealed the presence of these fibrils (Fig. 1) around the theca cells but usually not around the granulosa elements. We were not entirely convinced that the method could be solely depended on as the basis for the differential diagnosis between granulosa cell tumor and theca cell tumor in doubtful cases. Stains for intracellular and extracellular lipid substance were interpreted as giving positive results in all the tumors in the series (Fig. 2). Differential staining for the various lipid fractions as suggested by Wolfe and Neigus was tried but the results were difficult of interpretation. Results of chemical analysis for tumor lipoids are discussed and tabulated in subsequent sections.

Contralateral ovary. The contralateral ovary was available for study in the 2 cases in which necropsy was performed and in 19 of the 21 cases in which operation had been performed. Of these 21 ovaries 20 were somewhat atrophic and 1 was the seat of a benign multilocular cystadenoma. In the 2 instances in which the surgeon preserved one ovary no special notes were made with reference to its condition. Mature or developing corpora lu-

tea were not observed in any instance. However this was perhaps not surprising as much as many of the patients had already passed the menopause.

Condition of the uterus. The uterus was available for study in 21 of the 23 cases. Conceding that 100 grams represent the average weight of a premenopausal and 80 grams that of a postmenopausal uterus we can state that in 2 instances the uterus was considerably enlarged as a result of myohypertrophy (190 grams in 1 patient who was 70 years of age). In an additional 6 cases there were myohypertrophy and single or multiple fibromyomas. In 7 other cases fibromyomas so distorted the uterus that no conclusion could be drawn as to the presence or absence of myohypertrophy. Enlargement of the uterus associated with endometrial carcinoma was observed three times, an essentially normal size was seen twice and true atrophy noted in one instance. Since myohypertrophy and uterine leiomyomas can be experimentally produced in animals by the use of estrogenic stimulation the foregoing observations would lend some support to the thesis that at least some of our theca cell tumors were elaborating estrogenic hormone.

The endometrium in these 21 cases presented the following features of interest. In 14 cases the endometrial lining was grossly thicker than normal and in 12 cases microscopic examination revealed the picture of early or late proliferative phase of the menstrual cycle usually with addition of cystic change. (In 2 cases the endometrium showed the picture of secretory change.) Eight of the 14 patients were in the postmenopausal age group. (Although it is well known that normally the endometrium does not become atrophic immediately after the clinical cessation of menses we take the finding of such thick endometrial lining in some of our patients who were more than 60 years of age as fair evidence of estrogenic stimulation.) One patient had adenocarcinoma grade (Broders method) of the cervix and atrophic endometrium. Two other postmenopausal patients, one with no history of bleeding, also presented the picture of endometrial atrophy. Concomitant uterine carcinoma was found in 4 cases of theca cell

tumor in addition to the one cited in the foregoing. In 1 of these cases the tumor was adenocarcinoma grade 2—Broders (Fig. 3) of the cervix (Case 17) which produced death from widespread metastasis. In the 3 remaining cases there was adenocarcinoma of the uterine fundus without evidence of metastasis at the time of operation (Fig. 4). Thus 22 per cent of our patients with theca cell tumor had associated carcinoma of the uterus. Since this complication was not encountered in any patient less than 50 years of age the incidence of the association was 33 per cent for the group of older women. The carcinogenic influence of estrin is accordingly to be at least considered in these cases in which uterine malignant lesions are present (Table III).

CHEMICAL STUDIES

In the differential diagnosis between granulosa cell tumor, theca cell tumor, fibroma and so forth Greenblatt, Greenhill and Brown have employed chemical analysis of various lipid fractions of tumor tissue. These authors expressed the opinion that functioning tumors such as granulosa cell and theca cell neoplasms contain more phospholipid and cholesterol than do the nonfunctioning tumors such as for example fibroma. They further expressed the belief that theca cell tumors contain more cholesterol than is found in granulosa cell tumors.

In the present series the chemical analyses suggested by Greenblatt, Greenhill and Brown were carried out on portions of theca cell tumors not selected at random but chosen from cases which presented varied endometrial pictures (Table I). Also by way of comparison along a line not hitherto approached similar analyses were carried out on portions of presumably normal ovaries removed for various reasons in the course of pelvic operations. These ovaries were selected from patients of different age groups. The sections were taken from portions of the ovaries in which no old or recent corpora lutea were present and for the most part

If these 50 cc endometrial samples are typical of theca cell tumors, our series is of extreme importance. In several cases of granulosa cell tumors associated with endometrial carcinoma, the occurrence of reparative

represented ovarian cortical stromal tissues (Table II)

Results of both these chemical analyses were somewhat disappointing inasmuch as they did not show any striking correlation to exist between tumors having similar histologic structures and presumably similar embryologic backgrounds. In general the total lipid content of the tumors was found to be moderately elevated above that of normal ovaries (if we except the one specimen of the latter which contained 4.43 per cent of lipid substance). Individual values for lecithin and fatty acids did not appear to have differential significance. However cholesterol and cholesterol esters were present in definitely increased amounts as compared with the normal ovarian stroma with phospholipid levels somewhat lower.

FOLLOW UP STUDIES ON PATIENTS

Adequate follow up studies were made on 20 traced patients. There was in this group no instance in which the patient had died as a result of a malignant process beginning in a theca cell tumor. One patient died as a result of generalized metastasis from a cervical carcinoma as previously noted. Five additional patients died from causes apparently unrelated to their ovarian tumors. 0, 12, 5, 4, and 1 year postoperatively. In one case a small theca cell tumor was observed incidentally at necropsy. Thirteen patients were living at the time of follow up and had been well for postoperative periods varying from 6 months to 33 years. Surgical treatment in cases of theca cell tumor need be directed along radical lines only because of associated lesions that is uterine fibromyomas and endometrial carcinoma and not because of any malignant potentialities inherent in the theca cell tumor itself. Since however the incidence of associated uterine carcinoma is so high among postmenopausal patients who have theca cell tumors we believe that hysterectomy and bilateral salpingo-oophorectomy is the operation of choice in the case of older patients who have theca cell tumors of the ovary. Similarly it would seem from this study that postoperative roentgen therapy is indicated only in those cases in which carcino-

ma involves the cervix or the fundus of the uterus.

SUMMARY

Data on 23 cases of theca cell tumor are presented with a correlation of clinical pathologic and chemical data. These tumors appear to be derived from the ovarian mesenchyma and are closely related to the granulosa cell group of tumors. Occasionally the relation may be a histologic one with elements of both types discernible within the same neoplasm. Usually however both tumors present purity of type. The relatively high incidence especially in postmenopausal patients of associated myometrial hypertrophy and uterine fibromyomas combined frequently with endometrial hyperplasia and cervical and fundal carcinoma suggests the production by the ovarian tumors of estrogenic hormone. Inability to demonstrate measurable quantities of this hormone through assays of tumor tissue is perhaps not to be regarded as conclusive evidence of absence of the hormone. A chemical analysis of 8 theca cell tumors gave evidence that these tumors contained increased amounts of cholesterol and cholesterol ester fractions as compared with the values for these substances found present in 7 normal ovaries.

Although the tumors did not invariably produce clear cut clinical symptoms their presence could often be suspected by an alteration in the menstrual habits of the patient. Postmenopausal bleeding from a hypertrophic endometrium was commonly encountered in these patients.

Histologically in spite of the employment of new stains we found difficulty in distinguishing certain fatty fibromas from theca cell tumor. In such doubtful cases examination of the endometrium was often of value.

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THE RATIONALE OF CALCIUM PHOSPHORUS AND VITAMIN D THERAPY IN CLINICAL HYPERTHYROIDISM

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THE exact mechanism of action of calcium and its consequent therapeutic indications in hyperthyroidism are as yet not fully understood even though its use has been recommended for years by several experienced clinicians including Theodor Kocher. In fact certain investigators (26-27) have expressed doubt that added calcium would be beneficial in counteracting the negative calcium balance of this disease although their investigations had not extended this far.

Our knowledge concerning the influence of calcium administration on hyperthyroidism is as yet meager and at times confusing. In the treatment of any disorder it is advantageous to understand the physiological and pathological background of the disease for which the therapeutic agent is used. Wherever possible rational drug therapy should be based upon a correlation of the pharmacodynamic action of the drug with the pathological physiology of the disease. With these basic ideas in mind it seemed essential from a therapeutic standpoint to determine whether a positive calcium balance could be maintained on a high calcium intake. We therefore present observations concerning the effects of calcium therapy on the calcium metabolism of hyperthyroidism.

GROSS DISTURBANCES OF CALCIUM METABOLISM IN HYPERTHYROIDISM

The gross disturbances of calcium metabolism which exist in hyperthyroidism may be easily understood by study of the composite Figures 1 and 2 together with Table I. They usually consist principally of an increased excretion of calcium through both the gastrointestinal and urinary systems (Fig. 1). The

blood calcium usually remains within normal limits (Fig. 1). It is rarely slightly increased and almost never slightly decreased beyond the range of normal (56-66). The blood phosphorus is almost invariably within normal range. Only on one determination in one patient did we find it increased beyond the range of normal. Never has it been decreased. The blood phosphatase is usually slightly increased. These abnormal findings differ greatly from those in hyperparathyroidism in which the increased excretion occurs almost quantitatively through the urine (Fig. 2) while the blood calcium, phosphorus and phosphatase levels are usually greatly disturbed (Fig. 2). These abnormalities lead to definite differences in the clinical manifestations of the disturbed calcium metabolism in these two disease entities which may be of definite therapeutic significance as will soon be pointed out. The loss of calcium of the usual patient with exophthalmic goiter (10) is often much greater than that of the usual hyperparathyroid patient on a low calcium diet (Fig. 2) thus emphasizing the grave calcium depletion which may occur in hyperthyroidism. There is a lower level of increased excretion of calcium in toxic nodular goiter as compared to that of exophthalmic goiter (Fig. 1). This difference in excretion in the two types of goiter occurs even when the basal metabolic rates are at the same increased level as shown by patients presented in another communication (66) and by other patients with higher levels of basal metabolism (Fig. 3). However the state of the calcium balance is not wholly independent of the degree of hyperthyroidism. In patients with nontoxic nodular goiter the calcium metabolism remains normal (Fig. 1).

Disturbances of the calcium metabolism vary greatly. They are usually temporary, preventable and reversible in character. They can easily be controlled by ingestion or paren-

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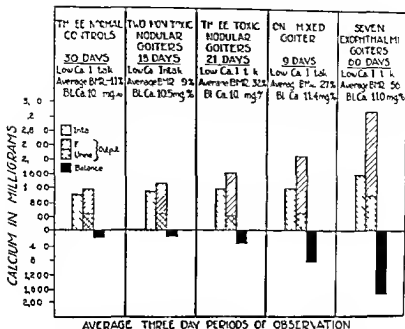


Fig. 10. Comparison of calcium metabolism in hyperthyroid patients and in normal controls.

teral administration of extra amounts of calcium as will be seen presently. Ingestion of milk with its high calcium content leads to calcium retention (Fig. 10). The state of the calcium balance in hyperthyroidism is dependent to a great extent therefore on the actual calcium content of the diet. If iodine

administration returns the basal metabolic rate toward normal one may expect a decrease in the calcium excretion (66). Parenteral administration of calcium (Fig. 10) thyroidectomy (66) or thiouracil (71) may also produce a positive balance.

Various experimental and clinical demonstrations of gross disturbances of calcium and phosphorus metabolism in hyperthyroidism have also been made. Falta, Bolaffio, and Tedesco (1909) were among the first to report the effect of the thyroid gland on mineral metabolism. They found that thyroid feeding increased phosphorus elimination. A most remarkable study was made in 1910 by Dr. Caroline Towles in association with Dr. L. F. Barker of the Johns Hopkins Hospital. She studied the calcium balance of three women with exophthalmic goiter, one of whom was pregnant. She concluded that the calcium metabolism of Basedow's disease shows no special peculiarity; it runs parallel with the nitrogen balance, and in those periods of the disease in which there is loss of nitrogen there is also a loss of calcium. She showed that the calcium balance may be made to be positive

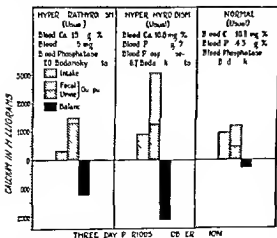


Fig. 11. Comparison of calcium metabolism in hyperthyroid patients and in normal controls.

TABLE I—COMPARISON OF CALCIUM BALANCE OF HYPERTHYROID PATIENTS WITH THAT OF NORMAL PERSONS AND NONTOKIC NODULAR GOITER PATIENTS

Type of disease	No. of patients	Age (yr)	Sex	Average urinary excretion of calcium (gm/24 hr)	Average urinary excretion of phosphorus (gm/24 hr)	Average urinary excretion of calcium (gm/24 hr)	Average urinary excretion of phosphorus (gm/24 hr)
Normal	11	38	—	4.28	8.5	—	—
Toxic nodular	3	—	+3	3.5	7	—	—
Myxedema	—	—	—	4.3	38	—	—
Euthyroid	60	—	+6	68	3	3.36	5.7

tive with a sufficient intake from milk or calcium lactate though not without evidence of the tendency to loss

Parhon (1912) demonstrated that intensive thyroid feeding up to lethal dosages administered to 9 rabbits produced a definite loss of calcium. Kummer (1917) studying an exophthalmic goiter patient of 42 years found that the urine calcium excretion was normal on an intake of about 3 grams of calcium daily from milk but that the fecal calcium elimination was large. Michaud (1930) reported increased calcium elimination in thyrotoxic goiter. Snapper (1933) found hypercalcaemia of almost three times the normal value in a case of Basedow's disease. Pugsley and Anderson (1934) demonstrated marked calcium loss of rats fed desiccated thyroid. In 1936 Coryn observed that there is excessive loss of calcium in the urine. Further work by Cope and Donaldson (1937), Beaumont, Dodds and Robertson (1940) and Logan, Christensen and Kirklin (1941-42) brought forward still more evidence that increased thyroid activity or thyroid feeding are associated with an increased excretion of calcium and phosphorus.

The mechanism of these disturbances in hyperthyroidism has never been clearly demonstrated (6, 12, 53, 66, 68, 69). Recent thioracil studies (71) would tend further to uphold our hypothesis (61) that the cause of this increased excretion is due to a combination of factors underlying which is the increased utilization of the thyroid hormone by the tissues. When thyroid hormone production is decreased mineral elimination returns toward normal.

CLINICAL MANIFESTATIONS OF THE DISTURBED CALCIUM METABOLISM IN HYPERTHYROIDISM

Clinical symptomatology. The thyroid gland may affect the structure and functional activity of every component of the human body. For this reason hyperthyroidism presents numerous clinical manifestations. Manifestations of the disturbed calcium metabolism in this disease are thus also greatly variable. Clinically they may be absent or so mild that they are masked by the more predominating toxic symptoms. Painful muscular joint and bone complaints are of frequent occurrence (67, 59, 9, 80). Usually these are mild in character. Severe forms are rather uncommon and may simulate symptoms of acute posttrauma-

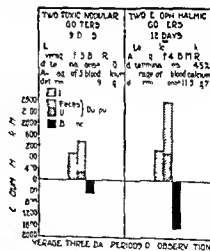


FIG. 3. Comparison of calcium balance in two toxic nodular goiters and two euthyroid patients. The figure shows that the hyperthyroid patients have a much greater urinary excretion of calcium than the euthyroid patients.



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matic or Sudeck bone atrophy. In many instances these have been erroneously diagnosed as a nonspecific and obscure form of arthritis. The first signs are swelling and intense pain on movement with subsequent increasing limitation of motion and atrophy of the muscles involved. Tenderness, myositis, contractures of muscles and pseudo-fixation of joints may later occur. In these more advanced cases the patient often becomes bedridden. In the early stages roentgenography reveals a generalized mottled atrophy; later there is more diffuse resorption with loss of normal trabeculations (Fig. 4). These phenomena may be manifestations of an autonomic nervous system disturbance which is frequently present in hyperthyroidism. In such cases high calcium and vitamin D feeding, as well as thyroidectomy, have been found to give definite symptomatic relief even though roentgenograms did not give evidence of recalcification (p. 80). Ordinary medical means except morphia failed to relieve the severe pain suffered by one of our patients (M.H.) but adequate calcium, phosphorus and vitamin D gave prompt relief.

There is greater tendency for the development of symptoms of the disturbed calcium and phosphorus metabolism in exophthalmic goiter patients than in patients with toxic nodular goiter. This is probably due to the fact that loss of lime salts is usually much greater in exophthalmic goiter. The manifestation of toxicity in nodular goiter is more frequently insidious so that they may exist for years before adequate treatment is instituted and therefore slow loss occurs over a long period of time. It is also possible that toxic nodular goiter patients who are usually older are predisposed further to senile osteoporosis.

Skeletal decalcification. Skeletal decalcification had been described by von Recklinghausen in 1891. Many similar reports of bone atrophy have since been made. Von Recklinghausen and Koepfen published accounts of a woman of 23 years with exophthalmic goiter of 5 years duration. At autopsy the bone saved like rotten wood, the sternum and calvarium being readily cut with a knife. Histologically, resorption spaces were abundant in the bone cortex and they often contained whole nests of osteoclasts. He believed this a form of osteomalacia secondary to Basedow's disease. Von Recklinghausen stated that the degree of osteoclastic resorption was equalled only by that found in a case of generalized osteitis fibrosa cystica studied by him. In 1901 Askanazy described necropsy findings of a woman of 34 years with retrosternal goiter of 5 years duration with carcinomatous degeneration and with metastases to the lungs. The histological picture revealed osteoclastic resorption of bone of greater severity and extent than could have been predicted from the macroscopic appearance of the bone. Latzko (1901) found hyperthyroidism present in 6 of 150 cases of osteomalacia. Hoennigke (1904) attributed the decalcification observed in thyrotoxicosis to a disturbance of phosphorus metabolism. Curchimann (1910) reported 30 cases of nonpuerperal osteomalacia, some of which were associated with hyperthyroidism. Plummer, Dunlap and Moore and Dunlap and Moore (1918-19) reported cases of osteoporosis. Four were secondary to exophthalmic and 1 to adenomatous goiter. They were all women. The ages ranged from 20 to

64 years. The duration of symptom of hyperthyroidism was from 1 to 13 years. The basal metabolic rates varied from plus 27 to plus 74 per cent. One patient had been bedfast because of so called arthritis. The bone lesions on x-ray examination were suspected of being carcinomatous metastases in patients but further study ruled this out. At autopsy the ribs of a 53 year old woman with exophthalmic goiter of 13 years duration and a basal metabolic rate of plus 41 per cent revealed multiple spontaneous fractures. They were friable and could be easily crushed between the fingers. Marked generalized osteoporosis was also present. Hunter (1930) reported the summary of a necropsy done by Prof. Turnbull on a girl of 19 with exophthalmic goiter of 5 years duration. Histologically lacunar resorption by osteoclasts produced much rarefaction of the cortical, the spongiosa and the medullary cavity. Another woman of 28 years with exophthalmic goiter of 5 years duration showed similar severe osteoporosis.

In 1932 Osterberg and Mill using Mayo Clinic material concluded that chemical and roentgenographic study of bone removed post mortem from the ribs and pelvis of 23 hyperthyroid patients and of 75 control subjects failed to demonstrate a sufficiently constant difference in percentage of ash, percentage of calcium, calcium to phosphorus ratio or roentgenographic opacity to warrant a conclusion that hyperthyroidism is always accompanied by some degree of osteoporosis. They stated that obviously ingestion of calcium is not controlled pre-mortem in clinical hyperthyroidism so that the results of work of this nature apparently can be only inconclusive. In experimental hyperthyroidism in estimation of calcium may be controlled. Smith and McLean as well as Drill reported that chemical studies of bones of rats with severe hyperthyroidism induced by thyroid feeding which were fed simultaneously a diet adequate in calcium did not reveal osteoporosis. Unfortunately their control of exogenous calcium was not entirely satisfactory.

Akaza and Rutishauser (1933) studied pathologic material from 7 cases in which patients had died of Graves disease. Osteoporosis

of some degree was evident in all. In 1938 Martos examined the bones of 12 patients who had died of exophthalmic goiter and found osteoporosis in 11. In 1938 Crotti reported the summary of a necropsy on a woman of 34 with exophthalmic goiter of at least 10 to 13 year duration. The x-ray examination showed generalized osteoporosis especially involving the bones of the lower extremity. A spontaneous fracture of the upper third of the right femur was present. The bones cut easily and could be crushed with the fingers. Histologically the bone marrow showed almost complete absence of bone forming tissue in the softest areas.

Radiologic findings. It was Kummer in 1917 who presented probably for the first time roentgenographic evidence of osteoporosis associated with hyperthyroidism. Roentgenography in the early disease is usually negative but in advanced stages generalized decalcification of the skeleton may be obvious as has been reported by numerous other observers (Fig. 4). This osteoporosis must be differentiated from that of several diseases. Among them are hyperparathyroidism, malignancy metastatic to bone, senile osteoporosis, atrophy of disuse, osteomalacia and osteoporosis which may accompany pancreatic diabetes as well as pituitary and adrenal disorders.

After calcium elimination studies as well as radiologic examinations of the skeleton of one patient Kummer judged from the roentgenograms that the calcareous demineralization affects the bony system. Bernhardt in 1917 made roentgenographic studies of a woman of 47 years with exophthalmic goiter. These showed a decrease of calcium in the bones. Aub and his associates in 1929 observed similar changes and pointed out that in mild cases osteoporosis can be detected only by direct comparison with the same bone of a normal person exposed on the same film at the same time. Hummer, Dunlap and Moore and Dunlap and Moore found roentgenographic evidence of severe osteoporosis in 4 patients with exophthalmic goiter and in 1 with adenomatous goiter. In 1930 Donald Hunter stated that in his experience controlled roentgenograms of the bones in exophthalmic goiter revealed a decrease of calcium in less than half

the cases examined Stettner has reported an interesting case of decalcification of the bones of a child resulting from the continued administration of thyroid. After the thyroid had been discontinued the bones became denser. Golden and Abbott made a roentgenographic study of 110 cases of hyperthyroidism in 1933. The age of the patients varied from 6 to 68 years. The duration of thyrotoxic symptom was from months to 6 years. In 63 instances only chest films were available. In the remainder there were films of the spine, pelvis or extremities. Eleven per cent showed slight while 11 per cent showed definite to marked decalcification. In 9 unselected cases a comparison was made to normal following Aub's method. These patients ranged from 22 to 50 years. The duration of disease was from 4 months to 4 years; in 3 instances it was not over 6 months. Of the 9 cases 5 showed definite evidence of osteoporosis and one slight decalcification. Still others such as Means, Hertz and Lerman (1937), Coryn (1936), Crotti (1938), Bartels and Haegert (1938) (9), William and Morgan (1940) and Mansbacher (1941) set forth their roentgenologic findings which suggest that osteoporosis is by no means rare in hyperthyroidism. Although the chronicity as well as the severity of clinical thyrotoxicosis is an important factor, cases have been reported of moderate thyrotoxicosis of short duration with definite evidence of osteoporosis on the x-ray film.

Further symptomatic of osteomalacia gross deformity, dwarfism and spontaneous fractures. In a few cases osteoporosis is profound in degree. Osteomalacia has occurred with or without subsequent gross deformity of the bones and dwarfism. In some cases spontaneous fractures have resulted. The severity of these symptoms depends upon the stage, the duration and the complications of the disease at the time of diagnosis as well as upon the degree of calcium excretion and the amount of calcium intake during the entire course of the disease.

Deformity and dwarfism may be due to fracture or severe osteomalacia. Subjective symptoms are often associated. The patient of von Recklinghausen and Koeppen who had osteomalacia complained of backache which

caused her to notice that her spine was twisted. Lam in both arm and sometime cramp in the hands and feet were also present. A lymphocolia was present. Askanazy's patient with osteomalacia and goiter was in bed with sacral backache following a slight fall. Latzko (1901) and Tolot and Sarrionat (1906) again drew attention to the combination of osteomalacia and hyperthyroidism. The latter reported a single case. They had found no observations in the literature on the relation of these two conditions. Von Jakich and Roth (1908) reported softening of the limbs of the bones in a girl of 20 who suffered from hyperthyroidism and Bernhardt (1917) observed a similar case.

One of the patients of Ilumner and Dunlap (1918) had been bedfast because of so-called arthritis. Another showed spontaneous fractures of the ribs and osteomalacia at necropsy. Hunter (1930) reported 2 cases in which spontaneous fractures occurred. Snapper (1933) stated that the osteoporosis produces much generalized pain and that it is definitely benefited by thyroidectomy. Coryn's patient, a woman of 35 years, presented painful osteoporosis especially of the tibiae. Another of his patients, a woman of 61 years with Basedow's disease of 9 years duration, decreased in height from 1.65 to 1.39 meters and sustained a multiplicity of spontaneous fractures of one femur, radius and vertebra associated with extreme decalcification. He believed that thyroidectomy benefited these patients. Gottlieb and Schachter Nancy's (1937) patient, a female of 53 years with exophthalmic goiter of 5 years duration sustained two spontaneous fractures of the right humerus and showed marked decalcification with a thin line cortex on x-ray examination.

One of the patients of Means, Hertz and Lerman (1937) who had had hyperthyroidism for 9 years was driving her automobile when she was suddenly seized with knife-like pain in the region of the lumbar spine. A roentgenogram demonstrated marked decalcification of the entire spine and pelvis and a compression fracture of the first lumbar vertebra. Another patient, a female of 48 had been bedridden because of long-standing osteoporosis. Dorsal kyphosis with flaring of the ribs was

present. Following thyroidectomy she gradually returned to her normal activities and the kyphosis improved greatly. Some of the improvement was attributed to an adequate diet of calcium and vitamin D. Moehlig and Adler (1937) mentioned the painful bones associated with hyperthyroidism. They did not believe that marked benefit could be derived from thyroidectomy. Crotti (1938) reported 4 cases of exophthalmic goiter and 1 of toxic nodular goiter who presented a variety of muscular skeletal symptoms. The age range was from 19 to 61 years. Three were females and 2 were males. Duration of toxic symptoms varied from 6 months to 5 years. X-ray examination showed definite osteoporosis in 3 and possible osteoporosis in 1. One patient who came to necropsy showed intense decalcification with a spontaneous fracture of the upper third of the right femur. Three patients showed remarkable improvement of the skeletal symptoms following thyroidectomy.

Bartels and Haggart in 1938 added more cases of primary hyperplasia of the thyroid with multiple spontaneous fractures of the femur and vertebrae after slight falls or stooping. They were females of 50 and 78 years. The toxic symptoms had been of 9 and 17 years duration respectively. Jung and Jacob (1939) described a fracture of the left clavicle in an elderly woman with osteoporosis and hyperthyroidism. Williams and Morgan (1940) added 7 cases of thyrotoxic osteoporosis seen at the Vanderbilt University Hospital. They were all females and their ages ranged from 39 to 65 years. Toxic symptoms had been present for from 3 months to 20 years. The basal metabolic rates varied from plus 31 to plus 65 per cent. Four were toxic nodular and 3 were toxic diffuse goiters. Four patients experienced muscle or joint pains before bone abnormalities were recognized. One exhibited scoliosis and tenderness over the lower thoracic and upper lumbar vertebrae. The roentgenograms revealed compression fractures of several vertebrae as well as generalized demineralization. Carcinomatous metastases were at first believed the cause. In one stiffness and bony enlargement of most of the joints of the extremities were noted. X-ray findings imitated metastatic tumor. A third

patient presented a pathologic fracture of the femur and generalized osteoporosis. Still another showed compression fracture of the lumbar vertebrae. Metastatic tumor was considered. X-ray examination showed marked generalized demineralization of the skull and long bones as well as of the vertebrae. The fifth patient showed kyphosis of the dorsal spine. Marked osteoporosis of the ribs and spine was evident on x-ray examination. Another patient revealed marked weakness and atrophy of the muscles especially in the hands. She sustained compression fractures of the thoracic vertebrae and demonstrated generalized decalcification. Three of the four patients exhibited tendencies to fall and one remained inactive because of fear that she would fall. Two improved symptomatically following thyroidectomy but none exhibited roentgenographic evidence of increased calcification 3 to 14 months after operation. The diet however was not carefully managed.

Mansbacher's patients, women of 58 and 61 years also complained of persistent pain in the shoulders and of kyphosis and back pain respectively. X-ray pictures showed generalized osteoporosis. Thompson (1944) recalled a minister with hyperthyroidism who was reported suddenly to have become 2 to 3 inches shorter on Sunday while preaching a few weeks after a thyroidectomy. He had suffered from spontaneous fractures of two vertebrae. X-ray examination revealed uniform decalcification. Two (M. H. and D. D.) of the 5 patients whom we report herewith showed generalized osteoporosis. One (M. H.) showed remarkable improvement of the associated musculoskeletal symptomatology and retention of as much as 1 gram of calcium and 12 grams of phosphorus daily when adequate amounts of these elements were supplied. They both showed clinical improvement following thyroidectomy although the x-ray picture even 5 months later showed no appreciable change except for definite recalcification of the hand bones of M. H. after continued adequate mineral intake. This may be explained on the basis that they had hyperthyroidism for a few years and that it would take many more months of adequate supply to replace completely the depleted store. On

patient (I M) complained of moderate deep aching pains of the extremities. Another patient (M C) complained of occasional vague pains over the entire body but especially of the lower extremities.

Calcium and production of goiter. An upset of the calcium metabolism has been considered by many a factor in the production of goiter since early in the nineteenth century (28-61). Investigators have all believed that a disturbance in the calcium metabolism is causally related to some of the toxic symptoms of hyperthyroidism. But not even the gross disturbances were revealed until recently (6-61). Even though the total blood calcium is usually normal a disturbance of one of its fractions may be present (54). This problem needs further investigation. The total protein levels (see tables) are usually normal. Slight decrease may be expected in 30 per cent of the cases, the level averaging 5.7 grams per 100 cubic centimeters of plasma and ranging from 5.4 to 5.9 grams (normal 6 to 8 gm %). Only one was decreased to as low as 4.9 grams per cent. Compare with Bartels' findings (8).

Clinical hyperthyroidism and hyperparathyroidism. In hyperparathyroidism with its usual hypercalcemia and hypophosphatemia there frequently results metastatic calcification. Urinary stones occur in about 50 per cent of the recorded cases () and constitute one of the serious complications of this disease. In hyperthyroidism on the other hand with its usual eucalcemia and euphosphatemia even in the presence of increased calcium and phosphorus excretion equal to or often greater than that in hyperparathyroidism (Fig.) metastatic calcification rarely occurs (48-53). Urinary stones are uncommon and are probably only coincidental. Cases of simultaneous hyperfunction of the thyroid and parathyroid gland have been reported (52). The real danger in feeding high calcium and phosphorus preoperatively to patients with hyperparathyroidism is that it may increase the predisposition to metastatic calcification. In hyperthyroidism no such danger exists.

In 1936 we discovered incidentally while doing iodine and calcium correlation studies that one of the patients with hyperthyroidism

showed remarkable retention of calcium over normal when enough was given to meet the increased metabolic requirement of the disease (66). This demonstrated to us the possible need for adequate calcium therapy and led us to investigate the effect of calcium feeding upon the negative calcium balance of hyperthyroidism. Until that time it had been believed that ingestion of extra amounts of calcium did not influence the retention of calcium. Since then we have given all of our hyperthyroid patients calcium, phosphorus and vitamin D preoperatively. In this respect it is significant that none of the patients who received an adequate supply of calcium, phosphorus and vitamin D developed so-called thyroid crisis. The postoperative reactions have been minimal. There have been no deleterious effects (64).

Certain patients with impending thyroid crisis who did not react to iodine or who escaped from iodine control subsequent to prolonged administration of iodine were treated successfully and more quickly prepared for surgery by use of adequate amounts of calcium, phosphorus and vitamin D as well as iodine and proper general management with out employment of an iodine vacation. Patients with severe acute spontaneous exacerbations of hyperthyroidism were more easily brought under control and more adequately and promptly prepared for surgery by use of the common conservative method including judicious bed rest and control of physical activity, freedom from emotional strain together with a balanced diet of high vitamin, high protein, high carbohydrate and high caloric content and iodination along with added calcium, phosphorus and vitamin D (64).

The fundamental importance of these clinical factors in the management of hyperthyroidism has led us therefore to attempt to determine the effects of adequate calcium, phosphorus and vitamin D therapy on the gross disturbance of the calcium balance in this disease.

EXPERIMENTAL METHODS

The principles underlying the clinical and laboratory methods have been set forth in de-

tail in previous papers (61, 6, 63, 66). In investigations were accomplished under strict conditions of supervision with only those directly in charge of the work being permitted to handle the food, the specimens and the medications of each patient. During a preliminary or observation period of at least 4 days to establish exogenous control of the calcium and phosphorus metabolism, the patient was reviewed historically and physically as well as by laboratory methods including the complete blood count, urinalysis, essential blood chemistry, radiologic studies and liver and renal function tests to determine suitability for study. At the same time the patient selected a constant adequate and palatable diet and became adjusted to the new diet and new procedures. Whereas our previous studies have been confined almost entirely to low calcium intakes, in this study many periods on a high calcium diet were also included to follow periods of low calcium intake. The calcium content of the diet was increased principally by the addition of milk. The high calcium diet was supplemented by use of different sources of calcium, phosphorus and vitamin D. The daily fluid intake, the salt intake and the acid base values of the diet were kept constant. The diets given and the dietary methods used are presented in another paper (5, 61). We considered the nitrogen balance because it has been shown that this usually remains negative in the hyperthyroid patient unless excess protein is given to maintain a positive balance. We did not do nitrogen balance studies. An allowance of 1 gram of protein per kilogram of body weight is usually enough to prevent nitrogen loss if a sufficient caloric intake is maintained to prevent loss of body weight. These patients were maintained at a constant weight throughout the low and high calcium and phosphorus feedings, and the protein content of both the high and of the low calcium and phosphorus diets was kept constant at $1\frac{1}{2}$ to 2 grams daily per kilogram of body weight. The carbohydrate intake was kept high. The fat intake was kept low.

A perchloric acid method (61) with minor modification was used for the determination of calcium in the food, urine and feces. The

serum calcium was determined by the Clark and Collip (15) method, the blood phosphorus by the method of King (37), the blood phosphatase by a modification of the Bodansky method (70) and the blood total proteins by the falling drop method of Fagan (36).

EFFECTS OF ADEQUATE CALCIUM PHOSPHORUS AND VITAMIN D ADMINISTRATION ON THE NEGATIVE CALCIUM BALANCE OF HYPERTHYROIDISM

Six patients with hyperthyroidism were investigated over several periods on diets of relatively low calcium content which were followed by periods of study on diets of high calcium content with added milk as the principal source of increase. The high calcium diets were then supplemented during subsequent periods by different sources of calcium, phosphorus and vitamin D. The protocol and results of the investigations of one patient (F.W.) have already been presented (66). Those of the other patients may be reviewed briefly as follows:

Case No. 4 399, white female, 52 years of age, entered University Hospital on March 31, 1941 for surgical treatment of the thyroid. She had a long history of hyperthyroidism, typical toxic nodular goiter of 3 years duration. The symptoms included nervousness, palpitation, fatigue, irritability, anxiety and nervous perspiration. There were pressure symptoms of dyspnea and occasional dysphagia. The appetite was so anorectic that food intake and weight loss for 8 months prior to admission. The predominant symptoms of hyperthyroidism were referable to the musculoskeletal system. These included the symptoms of acute post-traumatic osteoarthritis of the hip and neck. Genicled myasthenia and mild joint pains were associated. The myasthenia was so severe that she became bedridden. The pain was so intense that she required morphine on several occasions.

Physical examination showed a well-nourished white female with a marked tremor of the hands. The eyes were exophthalmometric readings were 6 millimeters which are normal. The thyroid was enlarged and nodular. The skin was moist and a tachycardia was present. Active and passive movements of the joints were limited by severe pain. Reflexes were hyperactive.

reported a similar case in which calcium and viosterol were administered with relief of symptoms but roentgenograms taken later did not give evidence of recalcification. Since our patient probably lost a considerable amount of calcium during the 3 years of hyperthyroidism it is possible that it will take more time to replace this loss. This should explain the failure of complete recalcification to become apparent on the roentgenograms after 5 months of adequate calcium phosphorus and vitamin D therapy following thyroidectomy.

This study again demonstrates the difference in the calcium excretion between exophthalmic goiter and toxic nodular goiter which is not so great in the latter. The maintenance of a positive calcium balance with a milk diet as well as with various calcium salts is also re-emphasized.

M. C. No. 413548, a white male, 136 years, entered the University Hospital on May 7, 1941. He was admitted from the dental office. She had had goiter for 20 years. Her main symptoms were dyspnea 5 years ago when she first experienced dyspnea and rarely dysphagia. During the past 3 years she became increasingly aware of toxic symptoms including nervous irritability, restlessness, profuse perspiration, and emotional instability. She had been gradually losing weight from 72 to 138 pounds in the past 3 years. She had lost 66 pounds in the past 3 years. She had been taking calcium salts and had gained weight. She had been taking calcium salts and had gained weight. She had been taking calcium salts and had gained weight.

Physical examination showed edema of the lower extremities, a heart rate of 100 per minute, and a blood pressure of 140/90 mm Hg. The patient was in good health. She had been taking calcium salts and had gained weight. She had been taking calcium salts and had gained weight. She had been taking calcium salts and had gained weight.

Admission red blood cell count was 3,300,000 per cubic millimeter, hemoglobin 14.2 grams per 100 milliliters, hematocrit 45.0 percent, and mean corpuscular volume 104.4 microns cubed. The patient was in good health. She had been taking calcium salts and had gained weight. She had been taking calcium salts and had gained weight. She had been taking calcium salts and had gained weight.

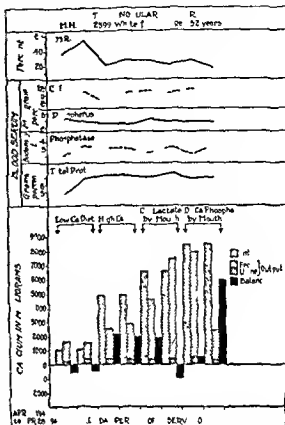


Fig. 5. The treatment of the patient with a milk diet and phosphate by mouth. The calcium balance is shown by the bars. The phosphate balance is shown by the line.

amylase was 75 units. The prothrombin was decreased to 54 percent of normal. The phenolphthalein test showed 60 percent excretion in the first hour, 30 percent during the second hour, and 10 percent during the third hour. The hippuric acid test showed 4 grams.

Calcium and phosphorus metabolism studies were made from May 10 to May 25, 1941. During the first 9 days a low calcium diet (Table III and Fig. 6) was given. This was followed by a diet high in calcium and phosphate principally due to addition of 600 cubic centimeters of homogenized milk supplement daily for 5 days of high calcium diet.

After the investigation period, as given with the patient, the basal metabolic rate and a total thyroidectomy was done. Gross and microscopic studies of the thyroid gland showed a hyperplastic thyroid gland with a few small nodules.

During our study of this patient there was a definite trend to clinical amelioration together with a slowly decreasing basal meta-

TABLE III—DATA FOR M C N 413528 WHITE FEMALE OF 56 YEARS TOXIC NODULAR GOITER

No.	Date period started	Weight kgm	Cal m				D	Blood				B.M.R. per cent	Remarks	
			Output			Intake gm		Serum cal mgm per	Serum phosphorus mgm per	Phosphatase Bodan-ku ml	Total gm per			
			Urine gm	Feces gm	Total gm									
Low cal m d f 86 cal es with 00 gm p in														
I	5	60	499		00	-0 3		5	4		4	+27	Bedres	
II		60	66	3 5	8	00	-0 3	5 5		8	7 6	6		+7
III	5 6	5		86		00	- 5			5 5	7 5	6		+
High cal m d f 3 6 cal es ppl m d by d-c l on phospho wh on l f re														
IV	5 9		44	6 3	9 5	8 98	+ 862	5	6		6	6	+3	600 m f m on f m h l d l
V		9	44	4 35	76	8 98	+ 06		7	57	6 6	6	+20	

abolic rate from plus 3, to plus 0 per cent. On a low calcium diet averaging 1109 milligrams per 3 day period definite loss of calcium oc-

curred over normal (Table III and Fig. 6). When more calcium was supplied principally from milk and wafers of dicalcium phosphate with viosterol a sudden reversal of the calcium balance occurred with considerable retention of calcium (Table III and Fig. 6).

This patient with mixed goiter showed a greater excretion of calcium than the usual patient with toxic nodular goiter but less loss than the usual patient with exophthalmic goiter. She clearly demonstrated retention of calcium when the nutritional needs for calcium were met.

L M N 408788 a white female 43 years
 tered United States pit 12 December 1941
 for management of phthalimide
 plant battery of m k d nerv s r r t b l t y se
 e e p l i t a n d m t i n a l n s t b l t y A b o t
 i m n t h p r t o d m h b e g t n o t e a s d
 d n g e a l d r v o s M k d t e m b l g
 t h e t m t e s h e d h s e s y f a t b l t y n d
 p o f p e r s p r a t i o l p e s t A w k l a t e
 s h e b r v d a l l g h r n e k w h h o l y
 b e c a m e f o r A e g h t l o f f o o m 05 to 47
 p o u d s a c m p a n e d t h e s e s y m p t o m I a d d i t
 t h e e e m l e t d p h n g p n s o f t h e p p e r
 a d l o w t r e m t e P l y d p s a n d p o l y e
 p e s e t a l o g t h c a l c h k g n t n
 n d n s m u n a

nd ins mma
lhy cal m nat r l l a ll n h d
tbl Th thy d gla d wa m l r tly a d d r f
f ly e la g d Fi t m s f the te d d b nds
t d Th p l r t Th phth l
m m tr d g s w r m l
The adm blood t d naly w
mal The W m l Kah clt fth
blood e g ti Th ba l m t bol c t

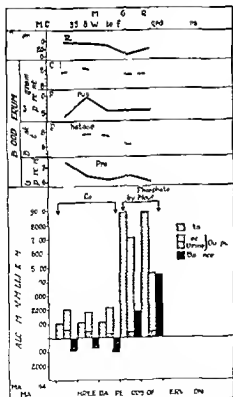


Fig 6. When adequate calcium was supplied principally in milk and as feed calcium phosphate with most of the dietary reversal of the calcium balance occurred with the highest feed level.

TABLE IV.—DATA OF R. M. N. 408788 WHITE FEMALE OF 45 YEARS WITH EXOPHTHALMIC GOITER

Food	D per cent of diet	Wt. in kgm	Cal m				D 94 94	Blood				B M R per	Remarks	
			Output			Wt. in gm		Bala gm	Serum calc m mgm per	Serum phosphorus m m per	Phosphatase Rodan ky per			T p m
			U l gm	Fe m	T m									
Low cal m d. 13000 l es h 90 gm pr														
I	8	67	15	764	43	265	-46		9.2	4	54	6.3	+95	B d
II	2-40	67	3.5	3855	5		-3	2-		5	78	6	+	
High cal m d. 1355 l es h 3 gm pr														
III		67.4	737	25	5	16	+6	1	6	4.5	3	5.5	+5	500 ml soft d
IV		67.3	3	5	6304	6.5	+0.5	1	4	3	3.6	-4	+09	500 ml soft d
High t m d. plm d h lc m l co t h m h														
V	50-	67.4	3.6	7-6	2	29	+0		6		7		+5	500 ml soft d
VI		66	7	9	9004	9.29	6	3	3	4		5.8	+01	500 ml soft d

plu 95 per cent with basal temperature 99 degrees pul e 120 and respiratory rate 20 the blood ure 20 syst lc and 60 diast lc and the body weight 67 kilograms Total blood d n was 4 m cr gr ms per cent ith the acetone soluble fraction 2.6 m grams per cent The blood sugar as 050 n l the ch lesterol 1670 m ligrams per cent The blood ure nitr gen was 10 m ligrams per cent Pr th mb n was 90 per cent of normal Th ph n l u l nphth l nre al fun t ion test h wed 50 per cent excretion in the first h r a d 5 per cent excretion during the second h r after t a en u dm ist t n Hippuric acid pat e f ct ont v l d d 33 grams Roe tg no gr ms of th h nd n l pelvis ho ved n det ectable osteoporosis

The calcium metabolism investigation was made from December 18 1940 to January 9 1941 A constant low calcium diet (Table IV and Fig 7) which the patient had been eating m d va g n d n g th first 6 l s (55) Th a s l l c l v a l e t of high calcium c n t n t p n c p a l l u t a l i t i of 500 cubic c m t m t r s f s k u d m l k l y f r the next 6 days (Table IV and Fig 7) The high calcium diet a supplemented b grams f calcium gl co ate d i v b m th d n g th l t 6 day f t d y (Table IV a d Fig 7)

Later treatment consisted of a l a q u t i l z a t n i t h i c r e f t h b a l m e t a b o l i c r a t e t p l u 50 p e r c e n t f l l d b a t o t g t h l e t m C a l e n c e a s u n c e n t u l C n l m o s c e p t e d y h o e d c h t t u e d i f f u h p e r l t e g t

This woman presented severe exophthalmic goiter verging on a thyroid crisis She improved greatly on general management with high calcium intake and the basal metabolic rate decreased from plus 115 to plus 64 per

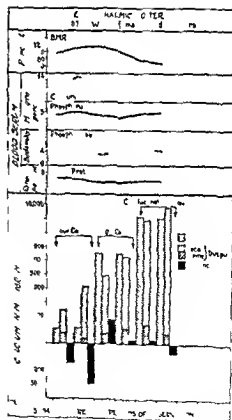


Fig 7. Effect of high calcium intake on basal metabolic rate and urinary excretion of hippuric acid.

TABLE 4.—DATA ON 1 M A 405171 COLORED FEMALE OF 1911 IRS WITH 1 NO. 11 TH M MIC COITER

I	II	III	IV	V	VI	VII	VIII	IX	Cal m					D	Blood				B I R	R m a l
									Chu pu			l k	B lan		Serum ic um mum pe	Serum hos- ph ru gm pe	Phos- h ase Roda h nu	T l pro m pe		
									L gm	Fee gm	Γ m									
Lower cal md f o r o cal es w h 99 gm per cia																				
I			21	996	260	065	—			3		5	+ 9	Bedres						
II	5		3	8	06	—	3		9	4	3	4	+							
II h l m d f g t es m																				
III	51		23	213	97	+0.13				6	6		+6	sym mu k dal						
I		6		9	+0			5					+5							
II h cal md ppl m d h t m l b m h																				
V					6								+	m regul						
I	-6	5	60	95	6	-0.26		6	3.3				+6	m i						
VII	-9	-4				+ 9.44	-8			6			+	d na i gm d ed i gm da ed gs II per ma k use id b						
Lo cal m d t d w h cal m bl i b																				
VIII		54	26		60	- 30				9			+	3 bl i kn i						
IX		6	90	24	50	+0.26	3		5.3	5	5		+ 3	ave i i v ual d l Da h pa il on d						

cent. The total blood iodine decreased to 9.11 with the organic fraction 2.43 micrograms per cent. On a relatively low intake of calcium averaging 1.033 milligrams per period there occurred a marked negative calcium balance reaching a maximum of 3.110 milligrams per period (Table IV and Fig. 7). A diet of high calcium content principally due to added milk was then given. On this increased intake of calcium 6.59 milligrams per period there developed a remarkable and early reversal of the balance with maximum retention of 1.677 milligrams of calcium per period (Table IV and Fig. 7). A decrease in retention of calcium to definite loss occurred in period V and VI when the high calcium diet was supplemented by calcium gluconate. The blood serum calcium remained within normal limits except for a definite rise in period II. The blood phosphorus and total protein remained within normal limits. The blood phosphatase was lightly increased in the first two periods but normal in other periods.

E M N 40817 a c l d fem l f g r
c t d L t r s ty Hosp t l N emb r 7 910
f th l t f b t l t h v o lect my m
th c t atm t f phthalm e g t Sh frst b
c m a f g t b u t 4 s m nth p r t
dm th t d v m p m f e phth
m n g n r v e s m r k d h t t l r
an f m t l t b l t Sh al c m
p f d f t m r s f both h d dy ph g
c n s d abl dy t Los f ght
f m 3 t p d e c d p t f a v
p p e t w t h e s food ant ke
Ph cal m nat d close d a ll h d
b t t r m ly app h y n g m h
f g h d 54 k l g m M l t e s phth l m o s
f t m f b th ha d r b s F phth l
m m t c r a l e s w s m l m e t r s b l t r l l a
d f i t a c a m l E m nat f the
k l l d f f l a g m t f both l b e s
l l a f th th m f th th v i g l l Th r
t d c y t l l t f th gla d A b r u t a s
l h e l b th l e s f h p l t o
Th fl h y p e c t
Adm d blood t 4 900 000 jth th
h m g f b 3 g m p e o o c u t c c n t m r s
Th h t blood t 3 9 00 t h t r ph l s
59 p e r e t l m p h o c y t e s 4 p e t n i m o c y t e s
p e c t l n a l g t e Th W s
m n d K h c t n f th b l d w g a

the basal metabolic rate on November 21 1940 plus 48 per cent with the basal temperature 98.4 degrees the pulse rate 92 the respiratory rate 15 the blood pressure 130 systolic and 60 diastolic and the weight 54 kilograms. Blood iodine was 20.90 micrograms per cent with the acetone insoluble fraction 4.48 micrograms per cent. The blood prothrombin was 73 per cent of normal which is within normal range. Blood amylase was 68 units. The blood sugar a 99 and cholesteryl 15 milligrams per cent. Blood urea nitrogen a 45 milligrams per cent. The hippuric acid excretion test as 23 grams a day which is below normal. The phenolphthalein renal function test showed 60 per cent excretion. The fasting blood sugar 5 per cent except during the second half after intravenous administration. Electrocardiogram showed sinus tachycardia. Roentgenography of the skeleton showed no detectable pathology.

Calcium and phosphorus balance studies were made from November 21 1940 to December 18 1941. A constant low calcium diet (Table V and Fig 8) which was suitable for the patient as given in the first 6 days. The plasma calcium a high calcium diet (Table V and Fig 8) containing 500 cubic centimeters of milk and 20 milliliters of the following 6 days. The plasma calcium content fairly regular in the high calcium diet for the first 10 days. The milk intake was 1 to 75 cubic centimeters daily during the period III, IV, V, VI, VII, VIII, IX, and X. The patient returned to the low calcium diet plus intravenous administration of calcium nitrate of 10 per cent calcium chloride solution daily.

Lactation treatment continued adequately on a basal lactation diet with the milk as per form of January 1941 followed by intravenous calcium chloride. Calcium chloride was administered of the form of intravenous calcium chloride solution in the following 6 days.

During our investigation the woman developed a diarrhea and slowly increasing basal metabolic rate of from plus 48 per cent on November 21 1940 to plus 83 per cent on December 15 1940. The total blood iodine however decreased to 10.99 with the acetone insoluble fraction 5.4 micrograms per cent and the other clinical symptoms improved during that period. On a low intake of calcium averaging 1.065 milligrams per 3 day period there was marked loss of calcium (Table V and Fig 8). A reversal of the balance with moderate retention of calcium occurred in periods III and IV on a diet of high calcium content principally due to added milk. During periods V, VI, and VII an uncontrollable diarrhea developed resulting in decreased

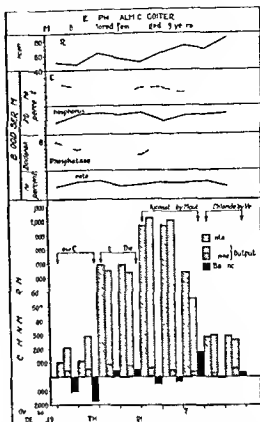


Fig 8. Intake of calcium by mouth 3 times daily maintained retention of calcium in spite of diarrhea.

retention of calcium in spite of a high calcium diet supplemented by 10 grams of calcium gluconate daily by mouth. The diarrhea continued during period VII even though only 750 cubic centimeters of milk was administered daily. During periods VIII and IX the patient returned to the low calcium diet supplemented by intravenous administration of 10 cubic centimeters of 10 per cent calcium chloride three times daily which maintained a retention of calcium in spite of the diarrhea. The blood calcium was slightly increased during period I (Table V) but ranged within normal limits on other determinations. The blood phosphorus was normal on several determinations. The blood phosphatase ranged from 4.4 to 7.9 Bodansky units and was definitely increased on few occasions. The blood proteins ranged from 5.4 to 6.5 grams per cent.

TABLE VI—DATA FOR D D N 418819 WHITE MALE OF 27 YEARS WITH EXOPHTHALMIC GOITER

P	od	D pe od ta ed	V igh kgm	Calcium					D	Blood				B M R pe	R m a k s
				O u p u			I k gm.	Bala gm.		Serum cal m mgm pe ce	Serum phos- phorus mgm pe	Phos- phatase Bodan- k un	T i pro m pe		
				U gm	Feces gm	T tal gm									
Lo calcium d I 86 cal es with 600 m p															
I		8	5	-4.3	68	3.7	09	-068	8	6		5.4	6.6	+4	B dres
II			3	-4.1		666	09	-		6			6	+	
H i b cal m d p p l m d w h i um lacta d d s d l b m h															
III			5		3.25	6	6.68	+0		5			6	+	600 regula
IV		7			3	5.436	6.63	+			4	6	6	+	500 m l k w s z ak lac d i i gm bd dal drops
H b cal m d l m d w h d cal m h o s h h v i s e l b m o u h															
V					5.6.6		8.26	+ .24	2-			3		+	600 m l k m m o p h a i d a f
VI					5.6	7.5		+ .99			6			+	
H b cal m d l m t e d h l m h l d b															
VII		-6		3	07	-4	09	+ 5	-8			8		+	3 h l i f i
VIII		-9	5	468		5.8	09	+ 6		3				+	ust i 600 l k d i

These findings illustrate the negative calcium balance found in exophthalmic goiter and the maintenance of a positive balance on a high calcium intake. They also reveal the development of calcium retention by the use of calcium chloride intravenously in spite of diarrhea.

D D No 4 889 a white male of 27 years
t ed University Hospital No 94 f c
th management of gen e phth l m g t
H g h i r y f g d l d e l p m t f a g t
d in th p t 3 3 rs Th at d with
as d r v t b l i t y phth l m o dy p
n a m l w k n e s s y f a t g a b i l i t y
t a l f i c w d y s p h g i a d e e d t l a n c
t h a t t m r s f t h e t m t e s p l p t a n d
p u l s e r s p e r t o n F n t l n d t m p o a l h d
c h e s a l o c c u d H m p l a d l p i n s t h
k n e s n d t h c a l f t h g a d l g m c l e s H e
h d l t w g h t f m 57 t 7 p o n d s n t h y e
p t a d m n n p l f s a p p e t t
H h d h a d n m d e a l t t t t t m e n t f t h
d e a s
Phy cal min t l d w l l d v l p e d
b t p o l v h d n g m h f l
p e s t h a t f t Th f w f l h d
S k w a m d m t T h w m k d
phth l m o s t h p h t h l m o m t d g s f 3

m l l m t s b l a t a l l y A d f t h p l p e l a l
f i s e s w a s p n t A l a g f t h p p l d s a s t h
y e s f l l o w e d t h e f i n g e r d w n w a r d d e m
s t r a t e d D i f f i c u l t y o f c o e g e n c e t e d T h p o
t r u d e d t g u e h d f i n e t e m T h k i
p u l t d p d l y d g l y T h w a m d
t e d f i s n l a r g m n t f t h t h y r d g l d f i c h
m v d n s w a l l o w i n g A t h l l w p l p b l a d a
b r u t w a s h e r d b y c h i t t h g l a n d T h
h a t r t e w p d T h f i t r e m f t h
t e d e d d a b d c t d f i g r s
A d m s n e d b l d c o t w 548 000 w i t h t h
h m g l b a c o n t e t 4 g m p t T h w h t
t w a s 76 w t h t h t p h l 68 p n t h
l y m p h o c y t e s 3 p t n d t h m c y t e s p e r
c t T h e a l y i s w g t T h e W a s r
m a d K h n t n s f t h b l o d w r e g
t T h e b a s l m t a b l c t e w p l 545 p e r c e n t
w t h t h e l p l s e t e 88 t h e s p t r y s t z
t h e t m p a t u e 93 d g r F t h b l o o d p e s r e
34 s y t o l c d 64 d t o l c d t h w g h t 17
p o n d T h t o t l b l o o d d n N m b e r 3
w a s 63 m i c r g r a m p e c n t w i t h t h a c t
u n s l h l f t 7 m i c g r a m s p e t T h
b l o o d n t r g e n w m l l g r m p e r t T h
p h n l f p h t h l n r n a l f c t t e s t h w d
8 p e c e t t t h f i r s t a d s p e c t
t d n g t h d h f t t r
a d m t r t T h b l d g w 69 a d t h
h l e s t e l 5 m l l g r a m p e t T h h p p c

acid effect on test yield 3.9 grams Roentgenograms of the vertebral column, shoulder and knee joints and both hands showed a slight decalcification.

Calcium and phosphorus metabolism studies were performed from November 18 to December 12, 1941. During the first 6 days a diet of low calcium content as given (Table VI and Fig. 9). A diet of high calcium content (Table VI and Fig. 9) principally due to addition of 600 cubic centimeters of homogenized milk daily was then administered supplemented by 3 grams of calcium lactate and 10 drops of drisdol (2500 units vitamin D) daily by mouth for 6 days. The high calcium diet as supplemented with 500 cubic centimeters daily by mouth for 6 days. During the last 6 days the high calcium diet was supplemented with 10 cubic centimeters of 1 per cent calcium chloride three times daily by vein.

A regimen of complete bed rest, adequate sedation and high calcium, high phosphorus, high vitamin and high caloric intake as well as adequate iodization was later followed. On this regimen the basal metabolic rate decreased to plus 20 per cent on December 5 with the basal pulse rate 84, the temperature 98.6 degrees, the respiratory rate 14, the blood pressure 120 systolic and 68 diastolic and the weight 177 pounds. Bilateral strabismic diplopia by a unilateral exotropia of the right eye was relieved by a unilateral exotropia of the right eye. Gross endocrine study showed diffuse hyperplastic goiter.

During our investigations on general management alone without iodine the patient improved clinically and the basal metabolic rate decreased from plus 45 to plus 31 per cent. The total blood iodine was 639 with the acetone insoluble fraction 151 micrograms per cent. The muscle and joint aches subsided. The basal metabolic rate further decreased to plus 20 per cent after adequate iodination. Much loss of calcium occurred on a low calcium intake (Table VI and Fig. 9). There was prompt response to added calcium in periods III and IV with a calcium retention of 75 as much as 1.131 milligrams per period. Period V and VI showed a further increase in retention of calcium on a high calcium diet supplemented with wafers of dicalcium phosphate with viosterol. A still greater increase in the positive balance occurred in period VII and VIII on the high calcium diet supplemented by calcium chloride by vein. The blood calcium was found to be increased on 5 occasions (Table VI). The blood phosphorus was increased on one occasion (Table VI). The blood phosphatase was definitely increased (Table VI). The total proteins ranged within normal limit (Table VI).

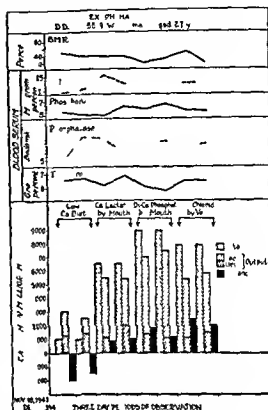


Fig. 9. The study of calcium metabolism during the period of observation. The study was conducted in the laboratory of the University of California, San Francisco, California.

This study again demonstrates the marked negative calcium balance in exophthalmic goiter on a low calcium intake. It also demonstrates the response to calcium therapy with a marked retention of calcium and a reversal to a positive balance which is easily maintained on three different types of calcium.

ANALYSIS OF STUDY

Gross disturbances of the calcium (Table I and Fig. 1) and phosphorus (64, 65) metabolism in hyperthyroidism vary greatly but are characterized chiefly by a grave loss of these elements both through the gastrointestinal and urinary systems when their intake is kept low or even optimum for normal persons. They are usually temporary preventable and reversible in character. They can readily be entirely controlled by ingestion or parenteral administration of adequate amounts of cal-

3,560 milligrams over a total period of 81 days remarkable retention of calcium resulted (Table VIII and Fig 11). The state of the phosphorus metabolism (64) showed similar spectacular changes with much retention of the element as will be reported in detail in another communication (65). Retention occurred whether the extra calcium was fed (Table VII) or administered parenterally (Tables V and VI) and in face of a severe diarrhea (Table V and Fig 8). In our series wafers of dicalcium phosphate with viosterol were instrumental in producing the most marked retention of calcium (Table VII and Fig 10) when the amount of each drug was administered within reasonable limits of palatability. Dicalcium phosphate with viosterol also produced the greatest retention of phosphorus (64, 65).

The disturbances of the calcium metabolism due to hyperthyroidism are usually temporary in their effects on bones but at times and especially in long standing hyperthyroidism in the presence of insufficient calcium intake permanent pathologic changes of bone may occur which have so far not proved amenable to therapy of any type. Practically this far advanced stage can be best treated by prevention with adequate calcium and phosphorus feeding and early diagnosis and treatment of hyperthyroidism. Muscular joint and bone pains as well as myasthenia are associated frequently and have been treated successfully with extra amounts of calcium, phosphorus and vitamin D by others (50) as well as by us. One of our patients (M H) presented prominent musculoskeletal symptoms. Pain was so severe that she required morphine on several occasions. Myasthenia was of such intensity that the patient became bedridden. X-ray examination revealed slight

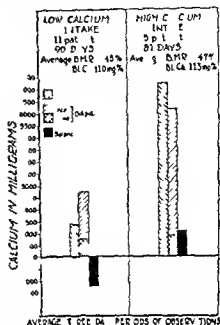


Fig 11. Hypothyroid patients. The calcium intake of these patients was adequate. The calcium intake of these patients was adequate. The calcium intake of these patients was adequate.

osteoporosis of the entire skeleton with moderate to severe osteoporosis of the left upper humerus (Fig 4). Administration of adequate amounts of calcium and phosphorus resulted in retention of as high as grams of calcium and 1.2 grams of phosphorus daily (Fig 5 and Table II). Within 8 days she obtained remarkable relief of pain. Movement of the shoulders became progressively better. The myasthenia decreased so that she was able to sit up in a chair. Orthopedic treatment had been at times used (9).

These studies reveal that ordinarily hyperthyroid patients require about 2 grams of calcium per day to maintain them in positive

TABLE VIII—EFFECT OF CALCIUM INTAKE ON CALCIUM METABOLISM OF SEVERAL CASES OF HYPERTHYROIDISM

Type of illness	Number of patients	T ald days	Ald days	Average calcium intake (mg)	Average calcium intake (mg)			Average calcium intake (mg)	Average calcium intake (mg)
					Intake (mg)	Excretion (mg)	Total (mg)		
Low calcium	11	90	+	110	5	6	100	3	+
High calcium	5	81	+	115	3	5	8	20	+

calcium balance which is at least twice the optimum calcium requirement for normal adults. Phosphorus requirements are similarly increased (64). When it is realized that the average American diet is barely sufficient to supply the normal adult requirements then it is easily understandable that with the greatly altered metabolism of these two elements in hyperthyroidism grave depletion frequently exists which should indicate urgent need for the application of prophylactic and remedial measures.

Without adequate milk or cheese in the diet it is usually impossible to obtain the calcium required by hyperthyroid individuals through food alone. We have found that milk is an excellent source of utilizable calcium and phosphorus for hyperthyroid patients when supplied in quantities of about one and one-half quarts daily. In rare instances diarrhea is present so that no milk or smaller amounts as tolerated must be given and other forms of oral or intravenous therapy must be resorted to in order to supply the deficiency. It must also be remembered that utilization of calcium may be inadequate even with sufficient intake unless the factors which determine optimum absorption and utilization are maintained such as low fat and neutral or slightly acid balance of the diet and proper phosphorus and vitamin D intake.

Most hyperthyroid patients when seen by the physician have had symptoms for at least many days. In such cases and in cases in which calcium loss has been severe or has occurred over a long period of time such as in patients with obvious osteoporosis 3 grams of calcium daily is a more adequate dose. We suggest that the high calcium diet be then supplemented by adequate intake of some form of dicalcium phosphate with vitamin D in order to restore these lost minerals. This product in our experience seemed to promote the retention of calcium and phosphorus 200 to 1000 per cent over that of other forms of lime salt.

At the moment one of the best indication for calcium, phosphorus and vitamin therapy is the necessity of managing some patients by nonsurgical means. This treatment constitutes an attempt to prevent the depletion and

tendency to osteoporosis which may occur even in hyperthyroidism of short duration. The patients included would be the inoperable case—those who refuse operation and those who for certain reasons are receiving thyroid or a combination of these forms of therapy. Calcium therapy is recommended for the reason that the number of failures in following these other methods of treatment varies but is usually high. Moreover significant decrease in toxicity is often not obtained for several weeks after beginning treatment.

With good medical management including a high calcium, high phosphorus and high vitamin D intake but without iodine one may usually expect definite improvement in the general symptomatology including the tremor, sweating, irritability and hyperkinesia. When musculoskeletal symptoms referable to the loss of calcium and phosphorus are present they usually disappear. A maintenance of a good weight and a gain in strength, a diminution in the tachycardia and a decrease in pulse pressure are often associated. Decrease in the basal metabolic rate usually occurs. When however iodine is then added there is often further clinical amelioration and further decrease of the basal metabolic rate. Calcium and phosphorus do have a definite place as replacement therapy in hyperthyroidism. On the other hand we do not advocate their use in place of iodine and the good general medical management used in the past.

In comparing the clinical course of those hyperthyroid patients since 1936 who have received adequate calcium, phosphorus and vitamin D along with the older preoperative principles which we used to practice (adequate mental and physical rest, adequate sedation, a well balanced diet of high carbohydrate, high protein, high vitamin and high caloric content as well as adequate iodination and treatment of existing complications) to that of patients treated prior to 1936 we have especially been impressed by the smooth postoperative course and absence of the so-called hyperthyroid crisis in recent years. The postoperative reactions have been minimal and there have been no detrimental effects (64). Because of these observations recently we

have treated in the above manner without iodine variation the iodine resistant patients with exophthalmic goiter with impending thyroid crisis particularly following the prolonged administration of iodine. This regimen proved successful in introducing remission so that the patient was more easily and more quickly prepared for surgery. Similarly patients with severe acute spontaneous exacerbations of hyperthyroidism were more easily brought under control and more adequately and promptly prepared for surgery. Long periods of preparation or of hospitalization before operation were thus avoided by this method (64).

True thyroid crisis is one of the most dreaded and most alarming of the postoperative complications. It accounts for 25 to 50 per cent of the immediate postoperative deaths in many clinics. It still occurs in spite of iodization and often occurs in the patient who is refractory to iodine. The causes of refractoriness to iodine and of thyroid crisis remain unknown. The gland of these patients often however shows hyperplasia with thinning or absence of the colloid. These phenomena are associated with lack of involution of the hyperplastic gland. Most evidence points to the fact that iodine therapy produces remission of thyrotoxicosis principally by increasing colloid storage of active organic iodine compounds. This is well shown by histologic examination which reveals marked colloid involution of the gland as well as by iodine analysis (62) by radio iodine autography (45) and by radio iodine fractionation (46) of the excised gland which show a high content of thyroxine diiodotyrosine and inorganic iodine in the colloid.

In 1920 Kottman showed that calcium increased the viscosity of the colloid in the thyroid gland. Cameron pointed out that of tissues other than bone the thyroid gland has the highest concentration of calcium (40 mgm).

Abelin revealed that calcium has an inhibitory action on thyroxin. The studies of Fellwig (9) did not support the view that calcium has its effect through neutralization of thyroxine. He (30-31) demonstrated experimentally that the hyperplastic thyroid secretes much colloid during simultaneous high

calcium and high iodine feeding. Thompson (1, 5, 76) showed in 1933 and 1936 that in rats on diets containing the same amount of iodine the blood iodine level was comparatively lower in the groups receiving additional calcium than in control. Later in 1934 Klem (38) was able to show that a high calcium diet promoted a greater storage of colloid during iodine therapy than with iodine therapy alone. It is this augmentation of the storage of colloid which may explain the therapeutic action of calcium in reversing an iodine resistant state to that of iodine remission and in preventing thyroid crisis. Further investigation of this problem is particularly necessary to determine the precise status of this regimen with regard to thyroid crisis to the iodine refractory state and to the effects of preoperative use of calcium phosphorus and vitamins. The optimal benefits of iodine are temporary and alone seldom constitute a satisfactory means of control. Up to date our method has been used in preparation for operation and not as an independent method of treatment. An investigation of our regimen alone without surgery is now under way to determine whether calcium prolongs the remission effect of iodine.

In spite of all our knowledge of the thyroid problem there is still much lacking in the medical treatment of hyperthyroidism. Witness the intensive studies made on thiouracil in an attempt to find a better method of treating these patients medically. Thiouracil therapy does result in retention of calcium phosphorus and nitrogen of hyperthyroid patients as shown by Sloan and Shorr and it decreases the blood content of the probably hormonal iodine fraction of the blood (19). It offers new hope of more effective medical control of hyperthyroidism (5). At the moment however it is too soon to predict whether this drug can be employed safely in the routine management of thyrotoxicosis. Unfortunately it has been found by several clinics that thiouracil possesses certain inherent dangers which do not allow it to be an ideal medicament. It is hoped that there will be discovered related drugs or new methods which possess the favorable action without the toxic side effect of thiouracil. While such new drug or new

method are being developed we are making careful clinical and laboratory studies of thiouracil in comparison to our method of preoperative preparation. It will probably take several years to determine the precise indications and limitations of these methods.

SUMMARY AND CONCLUSIONS

1 Calcium phosphorus and vitamin D medication is of undoubted value in the treatment of clinical hyperthyroidism. Especial attention must be given to calcium which in the usual diet is barely sufficient for a normal person. Hyperthyroid patients ordinarily require about 2 grams of calcium daily to maintain them in calcium retention. This is at least twice the optimum calcium requirement for normal adults. Three grams daily is a more adequate amount to restore the depleted calcium. Phosphorus requirements are similarly increased.

2 Eleven hyperthyroid patients maintained on a relatively low intake of calcium averaging 474 milligrams per day over a total period of 90 days showed an average loss of 4.9 milligrams per day. When five of these patients were further investigated on an adequate intake of calcium from different sources averaging 2,410 milligrams per day over a total period of 81 days remarkable retention of calcium occurred which resulted in a positive balance of 36 milligrams per day. The state of the phosphorus balance showed similar spectacular and beneficial changes. Retention occurred whether the calcium was fed or administered parenterally.

3 We supplemented our high calcium and high phosphorus diets with four of the most common types of calcium salt used in therapy. They were all effective in maintaining retention of calcium and phosphorus. However 3 of the 11 patients in our series received added amounts of phosphorus and vitamin D besides the added amounts of calcium in the form of dicalcium phosphate with viosterol. The latter seemed to promote increased retention of calcium of 200 to 1000 per cent over that of patients receiving only added calcium or calcium and vitamin D in palatable doses.

4 Hyperthyroidism in the presence of insufficient calcium and phosphorus intake often

precludes definite operation which may be detected roentgenologically. Severe cases of osteoporosis may lead to osteomalacia and spontaneous fracture. Gross deformities and dwarfism may result. Practically these complications of hyperthyroidism can be treated by prevention with feeding of adequate calcium phosphorus and vitamin D and early diagnosis and treatment of the hyperthyroidism. In late stages orthopedic measures may be necessary.

5 Muscular joint and bone pain and other symptoms are often associated. These can frequently be best controlled by calcium phosphorus and vitamin D therapy.

6 Calcium and phosphorus along with vitamin D have no deleterious effects in hyperthyroidism. They have a definite place as replacement therapy. On the other hand we do not advocate their use to replace the sound medical methods of the past including iodination but rather as a supplement to them. When thus properly used preoperatively we have been impressed with the much smoother postoperative course.

7 True thyroid crisis is one of the most frequent most dreaded and most alarming of the postoperative hyperthyroid complications in many clinics. It still occurs in spite of adequate iodination and often in the patient who is refractory to iodine. We feel that preoperative calcium phosphorus and vitamin D are important in the treatment of the iodine refractory and the precrisis states as well as in the prevention of thyroid crisis. These clinical effects are being further investigated.

8 Adequate calcium phosphorus and vitamin D should especially be administered to all hyperthyroid patients who for some reason do not come to surgery early. The patients included are those who refuse operation in operable cases and those who are being treated by thiouracil by older medical method by x-ray therapy or by a combination of these methods of therapy.

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THE POSTERIOR APPROACH FOR ARTHRODESIS AND OTHER OPERATIONS ON THE SHOULDER

PAUL H. HARMON, Ph.D., M.D., 5 yrs. Post-grad.

THE relative inaccessibility of the glenoid face of the capula and the entire acromion from the conventional anterior approaches to the shoulder has led the author to use a posterior route for arthrodesis of this joint. Greater familiarity with the shoulder from this side has increased the frequency with which this method has been used for other operations. As a result of this experience the author believes the posterior approach to be optimal for (1) arthrodesis of the shoulder, (2) operations upon the superior and posterior aspects of the humerus such as replacement of tuberosity fragments and repair of certain types of rotator cuff lacerations, (3) operations for posterior dislocation of the shoulder, and (4) all operations upon the glenoid except those demanding exposure of only the anterior portion. Familiarity with the posterior approach will increase the ability of the surgeon to demonstrate types of pathology in this joint other than those seen from the front. The author has used this method for shoulder arthrodesis in 10 cases, replacement of greater tuberosity fragments in 4 cases, for removal of exostoses on the posterior and inferior glenoid in 2 cases, and for exploration of the shoulder joint in 1 case. This approach is not to be used for operation upon the coracoid, the biceps tendon, and for most repair in the suprapinatus region.

The early surgeons approached the posterior part of the shoulder joint through a deltoid plugging route. This method fell into disrepute because of frequent injury to larger or smaller twig of the superior branch of the axillary nerve. This nerve and the branches of the supraclavicular nerve to the suprapinatus and the infra-pinatus should not be seen or damaged in any safe posterior approach.

McWhorter in 1935 described a posterior approach to the shoulder that has been the point of departure for the method described here. In Rowe and Yee have recently described a posterior approach for reduction and cure of posterior dislocation of the shoulder which differs only in certain minor detail from the technique described in this paper.

SURGICAL TECHNIQUE

The patient is anesthetized either on the side or in the 30 degree oblique position with the shoulder to be operated upon uppermost. The entire arm, axilla, and posterior shoulder are prepared and draped. The usual precautions are taken not to expose excessive skin surface.

The skin incision begins at the middle of the scapular spine and extends along and just inferior to it outward to the region of the tip of the acromion. The posterior extent of the deltoid on its noted subperiosteal dissection; then made of the portion of the deltoid originating from the spine of the scapula. The detached posterior deltoid is reflected laterally and inferiorly in the wound. Care is taken not to pull it below the level of the muscle belly of the teres minor and to keep instruments out of the muscle substance of the detached deltoid. Injury to the axillary nerve is thus avoided. The state of the dissection is shown in Figure 1 with the proposed line of incision in the rotator cuff and posterior joint capsule.

With the arm in neutral rotatory position a vertical incision is made through the tendinous portion of the rotator cuff. This incision can be made with impunity if properly placed in the tendinous portion and the operator keep away from the muscle belly of the teres minor and the quadrilateral space beneath it through which the axillary nerve emerges. The posterior joint capsule can then be separated from the perihumeral tendinous

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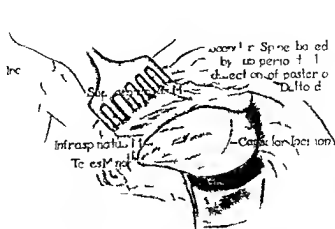


Fig. Superior & inferior dissection of posterior Deltoid.

strip of the rotator cuff and incised in any direction desired. Figure 2 shows the dissection at this stage. The approach at this level is practically bloodless, being through tendon and joint capsule. The exposure of the glenoid and head of the humerus is more extensive than by any other route except by the sabre cut method.

When an arthrodesis is performed the acromion is cut by transverse osteotomy, 2 or 2 1/2 inches from its tip and the latter is buried in a slot cut in the humeral head with the arm held in the correctly abducted position in the

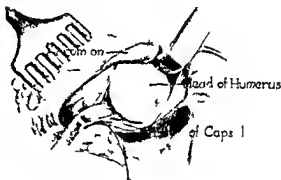


Fig. Deltoid dissection, capsule opened.

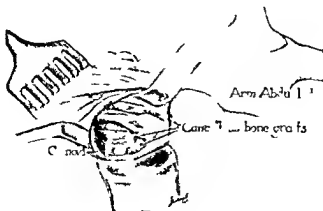


Fig. 3. Allograft bone grafts for arthrodesis.

MASSIVE EXTRUSIONS OF THE LUMBAR INTERVERTEBRAL DISCS

A. V. F. BRUGGHEN, M.B., Ch.M., M.S., F.A.C.S., Chicago, Ill.

A GREAT deal has been written on the subject of the ruptured intervertebral disc but it appears that insufficient stress has been laid on the serious complications which may occur when this condition is inadequately treated. The extrusion of a large part of a disc may compress the cauda equina and cause weakness of one leg with disturbance of urinary function or even a transverse cauda equina lesion with paraplegia and incontinence of the bladder and rectum. Dandy has drawn attention to these serious cases and it has been casually mentioned by most of those writing on the subject of the ruptured discs. Most of the patients with the cauda equina lesions described in this article languished for days, weeks or months without a correct diagnosis being made. It seems proper therefore to discuss the symptom complex and to give detailed case histories as examples in order to shorten the patient's illness and perhaps obtain better results. The condition when severe constitutes one of the rare neurosurgical emergencies and like some other such emergencies the result in spite of prompt and effective treatment may be unsatisfactory.

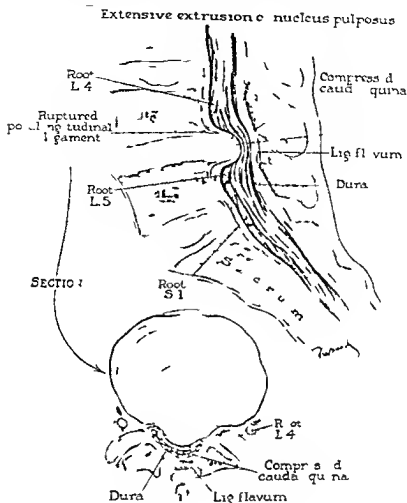
The symptom complex was of variable degree of intensity from slight weakness of the leg below the knee with saddle hypesthesia and severe sphincter disturbances. In all 9 patients were seen of whom 8 were operated on and 1 died before anything could be done. They represent the serious complication seen in perhaps 300 consecutive cases of typical herniated nucleus pulposus with sciatica and without bladder symptoms or incapacitating weakness. In most cases there was a "cog wheel" history in that the picture developed in successive acute short episodes. Four of the verified cases were in men and 4 were in women.

It is of course quite impossible to generalize from such a small group of cases but there are one or two points which may be of interest and which may be significant. The age group of the patients seems to be between 35 and 45 years. All but 1 had a history of backache for years and all but 2 had a history of both backache and sciatica for years. A history of trauma was obtained in 3 patients, no history of trauma was obtained in 3 patients and in the other 3 there was an incident which might be described as trauma for instance a severe sneeze or cough. As in the case in other types of root involvement most of the patients had pain on coughing and sneezing. The bladder mechanism was not seriously involved in only 1 case. Intermittent symptoms were characteristic as was the "cog wheel" history of gradually progressive spurts of trouble.

With regard to the signs presented it may be said that they are those to be expected from pressure on the cauda equina. Weakness and hypesthesia were observed in varying degrees though rarely bilaterally symmetrical. The Lasague sign¹ was positive in all the cases in which it was tested. 8 cases. The deep reflexes in the ankle were affected in all the cases and the knee jerks were involved in some or paralyzed in others depending on the level of the compression of the nerve roots. Six of 8 of the patients had a tender spine on deep pressure. Five of 9 of the patients showed a narrowed intervertebral space at the site of the herniation of the involved disc. Spinal fluid examination was not significant except for block or partial block when below the lesion and for the reverse Queckenstedt test. In 1 case (Case 2) the total protein was high.

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From the Department of Surgery, Presbyterian Hospital, Chicago, Ill. (Ch. Bruggen, M.D., F.A.C.S., and J. H. Bruggen, M.D., F.A.C.S.)



F g Sch m t d in t ll t t m p e s f th d t l y th
m ss tru f h m t d lumb int r s t b l d s

although the fluid was removed from above the lesion but the test was done under circumstances in which there was the possibility of error.

The location of the extrusion was at the lumbosacral joint in 3 cases between the 4th and 5th lumbar vertebrae in 1 case and between the 5th and 4th lumbar vertebrae in 2 cases (Fig. 1 and 2).

DIAGNOSIS

The diagnosis of a condition such as this may be rather difficult but a usual careful

consideration of the history and of the physical and laboratory findings led to a correct conclusion. The first case in this group was not properly diagnosed and neither was it very well worked up from the point of view of a ruptured disc. Appropriate tests were made for a spinal cord tumor which in a sense it was. There was so little sensory change as compared to the extensive and marked motor weakness that a variety of entities were entertained. However, the three cases all received a correct preoperative diagnosis including that in which a cerebral metastasis was present.

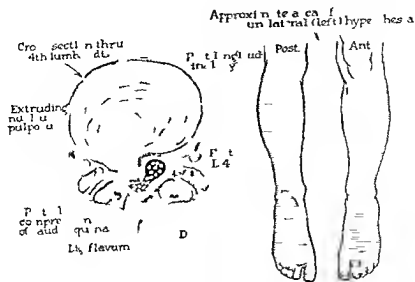


Fig. 1. Schmitt's diagram of the posterior longitudinal ligament.

tion was performed. Prior to consultation various diagnoses were considered ranging from multiple sclerosis through syphilis to lumbosacral disease of the spine and metastases to the spine. Although these erroneous diagnoses constitute the main reason for drawing the attention of the profession to this condition, little difficulty need arise with regard to multiple sclerosis or syphilis. However the possibility of metastases to the spine must be carefully distinguished from the condition under discussion. In both there may be a short history of pain in the back with pain down the legs followed closely by weakness and sphincter disturbance. The histories are dissimilar if carefully taken in that the ruptured disc comes on in one or two or a series of incidents (e.g. wheel) whereas the metastatic lesion as a rule presents a steadily progressive history. In attempting to judge between the two a search should be made for a primary focus or a history of an operation in which a malignant tumor may have been present. The consideration combined with a careful study of the x-ray picture of the spine will usually bring about the correct diagnosis. I have seen and operated on 2 patients with metastatic lesions of the cauda equina in whom nothing significant was seen in the roentgen pictures before

operation. One of the patients had had a breast removed 3 years before but the tumor contained in it was not thought to be malignant. In this case a neurological colleague advised operation on the basis of the probability and certainly possibility of a ruptured disc. In both cases the chest and spine films were considered to be negative. Lumbosacral disease occasionally causes cauda equina signs and symptoms but the history is short a few days to 2 or 3 weeks as in metastases to the spine. Here again the x-ray films of the spine may not help for tuberculous granulation tissue may form and compress the spinal cord without producing significant changes in the x-ray film. Spinal cord tumor must receive consideration but the shortness and jerkiness of the history compared to the extent of the disability make this diagnosis very doubtful. Certainly in this series except in the first case the diagnosis was not seriously entertained. Several other points help in establishing the likelihood of finding a ruptured disc. The spine is often tender in the region of the disturbed disc. Tenderness of the spine is not conspicuous in cases of innocent tumor of the cauda equina but in the case of malignant disease the spine is tender. The positive Lasegue sign is quite helpful for it is uncommon

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LUNG ABSCESS

An Analysis of 244 Cases

ANIBAL ROBERTO VALLE M.D. Ch. I. St. U. de V. reg. n. a.

IN this paper we attempt to analyze the more important features of 244 cases of lung abscess from the record of chest service Barnes Hospital and St. Louis Children's Hospital St. Louis Missouri during a period of 12 years from 1931 to 1943 inclusive. In spite of the advances made in the treatment of other diseases of the chest the methods so far devised for the treatment of lung abscess are not wholly satisfactory.

CLINICAL FEATURES

Differential diagnosis The differential diagnosis between lung abscess bronchiogenic carcinoma tuberculosis bronchiectasis interlobar empyema and secondarily infected cyst of the lung is important. Tuberculosis can be ruled out by repeated sputum examinations for tubercle bacilli in direct smears concentrations culture and guinea pig inoculations. In this distinction the onset of the disease is of consideration because tuberculosis seldom starts as an acute ailment. The secretion from lung abscess is foamy watery brownish and foul smelling as a rule and that from tuberculosis is very thick usually green and odorless.

To differentiate between simple lung abscess and carcinoma is more difficult because often there is a combination of the two resulting from an infection of the carcinoma. The x ray picture in bronchiogenic carcinoma often shows atelectasis of one lobe and a not well outlined shadow. Some cases of carcinoma develop pleural fluid in which carcinoma cells can be detected. We believe that the best means of differentiating between the two is bronchoscopy which in the case of bronchiogenic carcinoma will generally reveal the growth blocking the bronchus from which a biopsy can be taken. Sometimes the bronchus can be seen to be compressed from without.

In a few cases the tumor may be out of reach of the bronchoscope and an accurate diagnosis cannot be made until an exploratory thoracotomy is performed.

In cases of bronchiectasis complicated by lung abscess the long history and lipiodol bronchograms are valuable in differential diagnosis.

The distinction between interlobar empyema and lung abscess can be made by the fact that in the early stages of the empyema the patient does not cough or bring up any sputum. If the empyema opens into the bronchial tree and drains through the bronchus the patient has a cough productive of purulent and usually odorless sputum. The x ray picture of empyema shows a well demarcated shadow located in a fissure area.

Diagnosis often can be made between infected cysts of the lung and lung abscess. Usually there is more than one cyst in the lung and all of them are not infected. The infected cyst generally reveals on the x ray film a fairly sharp outline with thin wall as contrasted with the poorly defined outline of the ordinary abscess.

Location It is generally believed that the majority of lung abscesses are located in the lower lobes a belief borne out by the findings in our cases. This opinion favors the aspiration theory of the etiology of lung abscess. From a review of the literature on lung abscess this belief seems justified even though in some series of cases it has been reported that the upper lobes were more often involved than the lower. Cutler and Gross found the largest number of abscesses in the upper lobes and Flick and associates reported the same findings. On the other hand Freedlander states that the predominant sites are the apex of the lower lobe posteriorly and the lingula. Lueth and Sutton point out that they found the greatest number of abscesses in the right middle and lower lobes. In our patients the

right lower lobe was found the more common site of the abscess the next most common site being the left lower lobe followed in order by the right upper left upper and right middle lobes. Also included in this report are 6 cases of bilateral lung abscess.

TABLE 1—DISTRIBUTION OF ABSCESS IN OUR SERIES OF CASES

Location	N	Perce
Left upper lobe	9	7.5
Left lower lobe	49	
Left upper lobe	4	5
Right upper lobe	37	5.7
Right lower lobe	7	43.8
Right middle lobe	3	5.5
Right middle lobe	4	5
Right lower lobe	5	9
Right middle lobe	3	3
Right lower lobe	3	3
Total	44	

Etiology and pathogenesis. For many years there has been a great deal of discussion about the etiology of lung abscess. The opinion is divided as to whether it is produced by aspiration or by embolism. Cutler and Gross and Schleuter and Weidlen in support of the embolic theory cite the difficulty in producing abscess experimentally through the bronchi. They state that abscess occurs following local as well as general anesthesia and that in the majority of cases considerable time elapses between the operation and the development of the abscess. In their experiments with dogs they were able to produce abscesses consistently by using infected emboli. It is of interest that these abscesses healed quickly except when the emboli used were infected with pyorrhea scrapings in which cases chronic abscesses were formed containing anaerobic and aerobic organisms. Dogs however are not good animals in which to produce abscess through the bronchi because of the horizontal position of the bronchial tree and the great resistance of the lung tissue to infection. Nevertheless more or less constant results have been obtained by introducing pus from lung abscesses containing various organisms such as pyrochetes fusiform bacilli aerobic and anaerobic cocci when such material blocks the bronchus mechanically causing an area of atelectatic tissue with low resistance to infection. Occasionally in this manner chronic

abscess can be produced in the atelectatic area. Dr Duff Allen made the important experimental observation that it is not necessary to block the bronchus if the pus from a human lung abscess is immediately introduced into the bronchial tree of the dog while it is still warm. The organisms responsible for the production of pulmonary abscess are apparently very susceptible to cooling. Even if they are allowed to cool to room temperature they lose their ability to cause lung abscess in the dog unless the bronchus is simultaneously obstructed. This important observation of Allen's once and for all clearly showed that aspiration of suitably infected material can produce a lung abscess even in the absence of an obstruction.

It is the consensus that the difficulty in producing abscess via the tracheobronchial tree is due to the cough reflex and normal action of the cilia. This same is true in man and probably accounts for the infrequent development of lung abscess despite the frequent aspiration of infected material into the lungs.

Many authors support the aspiration theory by pointing out the increased frequency of occurrence of lung abscess following tonsillectomy and tooth extraction especially with highly infected gums and when ether anesthesia is used which increases the production of mucus and decreases the cough reflex. It is also emphasized that abscess occurs less frequently when the patient's head is kept lowered during the operation.

In our series we found that 41 lung abscesses developed after tonsillectomy under ether anesthesia and 27 after abdominal operation under general anesthesia. Myerson subjected to bronchoscopy a number of patients who had had tonsillectomies performed under general and local anesthesia and found blood and mucus in the lower bronchi in 90 per cent of the cases with general anesthesia but found it in a much lower percentage among those having local anesthesia and cough reflex present.

In 157 or 63 per cent of the cases in this series lung abscess was said to have followed pneumonia. Although during pneumonia the bronchus or bronchi probably become blocked by thick mucus which causes atelectasis in

the plunged off area and thus initiates favorable conditions for the development of an abscess the statement of the patient or even of his physician that the condition had its origin in an attack of pneumonia should be accepted with caution. Every lung abscess begins with a localized pneumonitis which often is considered to be a lobar pneumonia. As stated by Fisher and Finney, if virulent pneumococci are in the bronchial secretions lobar pneumonia will result but if anaerobic organisms of the mouth are present a lung abscess or gangrene might result. As stated before normal lung tissue is highly resistant to infection but atelectatic tissue is easily infected. This viewpoint is expressed by many writers in recent literature.

Other causes of abscess in our series were aspiration of foreign body, subphrenic abscess, congenital cystic disease, encephalitis in 1 case and in 7 cases the cause was unknown.

In our 36 cases of lung abscess among children 8 cases or 3 per cent were caused by aspiration of a foreign body. None of the abscesses in our adult patients was caused by aspiration of a foreign body.

TABLE II—CAUSES OF LUNG ABSCESS IN OUR SERIES OF CASES

Cause	No.	Per cent
Pneumonia	4	6.8
Pneumonia (gangrenous)	5	6
Foreign body	8	3
Subphrenic abscess		
Idiopathic		
Post-encephalitic		
Congenital cystic disease		
Unknown	7	
Total	44	

Bacteriology. In our cases cultures were taken preoperatively from the sputum from material obtained by bronchoscopy and post-operatively from material obtained directly from the abscess. It is difficult to determine the exact bacteria causing the abscess because in most cases there is a combination of two or more types. Both aerobic and anaerobic bacteria are found in lung abscess cultures as are also facultative anaerobes. According to Varney aerobic organisms first invade the healthy tissue and prepare the way for further damage by the anaerobic organisms.

The flora found in lung abscesses is remarkably similar to that found in the mouth especially in a mouth with infected gums.

In our series pneumococci were found in per cent of the cases. Staphylococcus aureus in 18 per cent, fusiform bacilli in 1, per cent, hemolytic streptococci in 14 per cent, Micrococcus catarrhalis in 12 per cent and pirochetes in 5 per cent.

D. T. Smith has found fusiform bacilli and pirochetes associated with anaerobic streptococci and vibrios in the wall of the lung abscess and with that combination produced abscess experimentally in animals. Some writers consider that the pirochetes and fusiform bacilli are secondary invaders also that they are an important etiologic factor in the chronicity of the abscess and that they probably contribute to the foul odor of the sputum and bad breath.

Philip Varney made a noteworthy study of the bacteriologic factors causing lung abscess. He emphasizes the importance of searching for anaerobic as well as aerobic organisms. In his series of cases he found Bacillus melaninogenicus in 94 per cent of the cases. He also found that the cultures of this organism had the very foul characteristic odor of putrid lung abscess and that the strength of the odor increased with the number of these organisms present. His findings show that the chief organisms concerned with this process are Bacillus melaninogenicus, fusiform bacilli, pirochete and streptococci especially of the viridans type. In the present series cultures for Bacillus melaninogenicus were not made.

TABLE III—ORGANISMS FOUND IN CULTURES MADE ON CASES IN OUR SERIES

Organism	No.
Pneumococcus	7
Staphylococcus	9
Fusiform bacilli	7
Hemolytic streptococcus	4
Micrococcus catarrhalis	
Streptococcus	5
Streptococci	5
Infusoria bacilli	
Others	

Symptoms and signs. Almost without exception cough is present in all cases of lung abscess and is the earliest symptom usually being dry at first and becoming productive

later. At first the sputum is meager but in creases and often becomes foul as the abscess progresses. Many types of sputum are found in abscess patients: odorless purulent sputum, mucoid sputum, blood streaked and thin, foamy, brownish colored foul sputum. In our cases 88 per cent had foul sputum and 11 per cent had odorless sputum.

Hemoptysis occurred in 57.8 per cent of our patients with lung abscess and these results are consistent with results of other writers. Hick and associates reported hemoptysis in 43 per cent of their patients. Warner in 54 per cent and Fisher and Finney in 20 to 40 per cent of their patients.

In about 90 per cent of our patients we found chills and fever present. Ninety-four per cent of the patients had chest pain of the pleuritic type as an early symptom. This symptom is an important consideration in patients who are to have surgical drainage because this is sometimes an indication that the pleura is adherent in the abscess region thus increasing the possibility of a one stage operation.

On physical examination we found in many cases foul breath, pyorrhea and dental caries, dullness to percussion, suppressed breath sounds and râles over the abscess area. The breath sounds varied from bronchovesicular or tubular to amphoric when the cavity was large, superficial and empty. It is worthy of note that some of our patients exhibited no pulmonary symptom. Also it was observed that in some cases the symptoms varied from time to time; for instance at one time there might be chest symptoms and on the next examination no symptoms at all. We found clubbing of the fingers and toes occurring more frequently in chronic cases than in acute cases. With reference to the laboratory examinations in acute and subacute cases we found frequent leucocytosis and in the chronic cases frequent anemia.

It goes without saying that x-ray examination is important in the accurate localization of the abscess. If sufficient time has elapsed since the onset of the trouble one may see that the x-ray picture has changed from that of an ill defined area of pneumonia to one of a sharper demarcation and then to that of a

cavity with a visible fluid level. It is not advisable however in most cases to wait for this development to occur before treatment is instituted. Of course the localization of the abscess will be facilitated by the making of films in different positions. We find lipiodol of little use in localization of abscesses because it seldom enters the cavity itself.

Age and sex. Of our 244 cases 208 were adults and 36 were children. The average age of the adult patients was 35.9 years and the ages of the children varied from 1 month to 13 years, the greatest number of patients being between the years of 5 and 10. Of our cases 154 were male and 90 were female.

Duration of disease. The duration of disease in our cases ranged from 3 weeks to 19 years. In this report we have considered as acute cases those of no more than 2 months duration. All cases lasting more than 2 months we have considered as chronic; the average duration being 1 year. We present 110 acute cases of which 63 patients had surgery and 47 had no treatment other than bronchoscopy, and 134 chronic cases of which 101 patients had surgery and 33 had nothing except bronchoscopy.

TREATMENT

Prophylaxis. Prophylaxis is of great importance in any discussion of lung abscess. Good care of the teeth, gums and throat is imperative before any contemplated operation especially one of the upper respiratory tract. It is also important in operations in which deep and prolonged anesthesia is necessary in which case the production of mucus is increased and the cough reflex is diminished sufficiently to permit aspiration into the smaller bronchi. Sometimes the material aspirated in this manner is thick enough to plug the bronchi thus causing atelectasis or is infected with pus producing cells from the mouth or other organisms from the upper respiratory tract causing secondary infection.

Strong sedatives should not be used before and after operation because they decrease the cough reflex and facilitate the retention of the secretion in the lower bronchi.

One of the most important steps in post-operative prophylaxis is the frequent aspira-

tion of the bronchial secretions and vomitus if present in the trachea by nasal catheter. Inhalation of oxygen and encouraging the patient to cough after operation are two other prophylactic measures.

Medical treatment. Nonsurgical method of treating lung abscess except bronchoscopic aspiration have been largely discarded because they are ineffective and because they lead to delay in the performance of surgical drainage. Some abscesses however become healed spontaneously by breaking into a bronchus and thereby accomplishing the same effective drainage which the surgeon aims to create by external drainage. But this fortunate result is not to be expected. In general a lung abscess that seems not to be draining itself adequately through a bronchus should have external drainage as soon as the diagnosis has been established. Neuhof's writings on this subject which will be discussed more extensively later have had great influence in changing our conceptions. It is always possible of course that some specific agent against the infecting organisms may be discovered which will reduce the necessity of surgical interference. But apparently that agent is not yet at hand. Penicillin seems to be helpful in some cases but not in most.

In all our lung abscess cases postural drainage was given a fair trial as treatment except in those cases with abscesses located in the upper lobes. We start the patient on postural drainage for 5 minutes and increase the time gradually to 30 minutes. The patient is put on a specially built postural drainage table from two to three times daily with the table tilted to a 45 degree angle. We encourage the patient to cough and expectorate during these periods. Sometimes this procedure coupled with bronchoscopy cures the abscess without surgical intervention.

Bronchoscopy. Most of our bronchoscopies are performed under avertin anesthesia administered rectally 85 milligrams per kilogram of body weight. In poor risk patients or patients with severe heart conditions we use local anesthesia pontocaine per cent.

Of our patients 92 per cent have had either one or more bronchoscopies. We consider this one of the most important feature in the

diagnosis and treatment of lung abscess. In 80 patients treated only by bronchoscopy 4 were improved.

As a diagnostic procedure it is very useful in localization of the abscess by revealing which bronchus is the source of the pus. It is invaluable in making a differential diagnosis between a simple lung abscess and one associated with a carcinoma. In our experience an occasional patient exhibits the symptoms of a lung abscess which is only a complication of a bronchiogenic carcinoma. The tumor blocks the bronchus and causes an area of atelectasis followed by a lung abscess the symptoms of which predominate. On bronchoscopy the tumor is revealed and changes entirely the aspect of the treatment of the case.

As a part of the treatment bronchoscopy is much used. Sometimes the draining bronchus becomes plugged and by introducing the flexible suction tip into the bronchus the mucus plug is removed and drainage promoted. As before mentioned it is used as a means of keeping the bronchus open to facilitate postural drainage. We do cauterization through the bronchoscope to remove the granulation tissue which sometimes forms and blocks the bronchus. This procedure also aids in draining the abscess through the bronchus. Patients in bad condition can often be so greatly improved by several bronchoscopic aspirations that the later surgical drainage becomes less hazardous.

We consider bronchoscopy imperative whenever aspiration of a foreign body into the bronchial tree is suspected.

Surgical treatment. Neuhof and Tourouff have suggested early one stage surgical drainage in acute lung abscess considering as acute abscesses of not more than 6 weeks duration from time of onset of first symptoms. As basis for the soundness of this suggestion they state that from observations at operations and autopsies the lung abscess cavity exists within 1 week or 10 days of the onset of infection. The lesion is usually superficially located in the lobe and adhesions develop very early in the disease which facts make possible a one stage operation. At early operation they state they find a solitary unilocular lesion associated with walling off pleural adhesions.

By early operation the possible complications of spread of infection by spill-over fibrosis of surrounding pulmonary parenchyma formation of multilocular cavities and bronchiectasis are avoided. Also there is less chance of development of metastatic abscesses in other parts of the body particularly in the brain and amyloidosis. The results obtained by them justify their recommendation of early operation since they report a series of 122 operations for acute lung abscess with a mortality rate of 3.27 per cent.

The majority of our patients had reached the chronic stage when they came to us for treatment. We have found that external drainage of the abscess is the most effective surgical treatment for lung abscess. In this treatment accurate localization of the abscess is an important factor to ascertain the point where the abscess is closest to the parietal pleura which determines the approach. When the site of operation is decided an incision varying from 10 to 15 centimeters in length is made along the ribs to be resected. We resect as a rule two ribs subperiosteally in about 10 centimeter lengths. The position of the patient on the operating table depends upon the side to be operated upon and the localization of the abscess. The majority of our patients were operated upon in the horizontal position with the side to be operated upon uppermost. In patients in whom we expect to find several bronchial fistulas we place the patient in a semi sitting position to keep the secretions in the lower bronchi during the operation and from plugging the major bronchi to prevent suffocation.

We use general anesthesia in all cases but at times use avertin as an induction anesthesia. We use either nitrous oxide or intravenous pentothal.

In this series we used the actual cautery to unroof the abscess cavity. This procedure was carried out in one or two stages depending upon whether or not the lung was adherent to the parietal pleura. At removal of a section of the rib overlying the abscess it can be readily seen whether or not the lung is adherent to the parietal pleura or moves freely beneath it. In cases in which the pleura is not adherent the operation must be done in two

stages. In our series we found a two stage operation necessary in 50 per cent of the cases. At the first stage we pack the rib beds with either acriflavine or iodoform gauze to create adhesions. We allow the pack to remain in place without changing from 10 days to 2 weeks.

When the pleura is found adherent we use needle aspiration in order more accurately to determine the real position of the abscess after which by means of cautery the abscess cavity is widely unroofed. All necrotic tissue and pus are aspirated by suction. After it is unroofed the cavity is tightly packed with acriflavine gauze and then a dry dressing is tightly applied. We let the pack stay in place from 4 to 5 days at which time it is changed under general anesthesia intravenous sodium pentothal. The second change of the pack can be made under morphine hypodermically without too much discomfort to the patient. Thereafter the pack is changed every other day and packed more loosely in order to give the lung a chance to re expand.

When the abscess is located near the periphery of the lung and is open into the pleural space with subsequent empyema we do a thoracotomy drainage with rib resection. Occasionally when the chest is opened it is found that the opening through which the abscess drains into the pleural space is not large enough and we enlarge this opening with cautery. The pleural cavity is drained by means of a large rubber tube. This operation is performed under the same anesthesia as we use for cautery. The patient is placed in the semi sitting position because so many bronchopleural fistulas are present.

TABLE IV — TYPES OF OPERATIONS PERFORMED AND THE NUMBER OF CASES HAVING EACH

Operation	N
Cautery	97
Thoracotomy	37
Lobectomy	3
Intercostal resection	2
Total	64

We do lobectomy for lung abscess in cases in which the cavity does not heal completely and the bronchopleural fistulas are still present 6 months or more after the cautery opera-

tion is performed. If however any active infection is present lobectomy is a dangerous operation. In this series 28 cases of lobectomy for lung abscess are included. The lobectomy is performed under cyclopropane intratracheal anesthesia with the patient in the horizontal position with the side to be operated upon uppermost. We never start the operation until 5 per cent glucose in saline or distilled water is running intravenously. Shortly after the operation begins we start blood transfusion. In the average case the patient is given routinely a transfusion of 500 to 1000 cubic centimeters of whole blood. The posterolateral incision is used and the 6th rib removed subperiosteally. In chronic lung abscess cases because of the many adhesions and the presence of scar tissue the dissection of the hilar structures is either so difficult or impossible in some cases that mass ligation of the hilus is the only safe procedure. Of the 28 lobectomies reviewed in this series we used individual ligation in only 7 cases. We routinely drain these patients with two rib resection drainages, one in the posterior axillary line through the 7th or 8th rib and one in the mammillary line through the 6th or 7th rib. We keep this procedure as a closed drainage from 10 days to weeks and then use open drainage. In patients with lung abscess and secondary bronchiectasis with copious bronchial secretions bronchoscopy is carried out before and after the operation.

We also have 2 total pneumonectomies for lung abscess in this series in which there were multiple abscesses involving the entire lung.

Postoperative complications. One of the most serious postoperative complications in lung abscess is hemorrhage. The use of the cautery makes hemorrhage less likely to occur and we found that tightly packing the opening after the operation helps to prevent hemorrhage in many cases.

Occasionally a complication is caused by spillover of pus into the healthy lung tissue. Sometimes this has caused involvement of the opposite side blocking the bronchus and spreading the disease. This mishap can be avoided by frequent aspiration of secretions and encouraging the patient to cough during the early postoperative period.

Whenever the abscess is close to the pericardium and the cavity ruptures into the pleural space and bronchopleural fistulas are present empyema occurs. We found in our series 4 cases of preoperative empyema. As a postoperative complication it is a rare occurrence because we exercise much care to see that adhesions are present before drainage is attempted. When the empyema occurs the patient usually develops an anaerobic infection of the pleural cavity which requires adequate drainage and changes the prognosis in the case for the worse.

Another complication worthy of consideration is septic spread of the disease to other parts of the body. These abscesses exhibit the same type of pus, the same odor and the same bacteriological flora. In our series we found sometimes metastatic abscesses even in the abdominal wall and in the lower extremities. Two frequent sites are the kidneys and the spleen.

Brain complications. Sixteen or 5 per cent of the cases had brain complications. Nine were proved brain abscess cases, 4 were doubtful and 3 had cerebral embolisms. In only 1 case was an operation for the brain abscess performed and this was unsuccessful. In 1 case the lung abscess followed a craniotomy.

In many of our cases bronchopleurocutaneous fistulas were present after operation. Often they close spontaneously but when they remain for long periods of time they require lobectomy, plastic operation such as muscle graft or Schede thoracoplasty.

RESULTS
TABLE V.—RESULT OBTAINED IN
OUR PATIENTS

Result	Successful	Unsuccessful	Total
Mortality	5	1	6
Impaired vitality	1	1	2
Unsuccessful	1	1	2
Total	7	3	10

It is very difficult to state just what type of treatment is best for lung abscess because there are so many variable factors to be considered in each case. The success of the treatment depends upon the duration of the disease prior to operation, the patient's general condition, the etiology of the disease, the bacteriological flora, and the location of the abscess.

In our series 164 patients had surgical treatment and 80 patients had no surgical treatment. Of the patients treated by bronchoscopy only 61 per cent were improved and the mortality rate was 20 per cent. In those having surgery, 62 per cent were improved and the mortality rate was 38.8 per cent. In the series as a whole the overall mortality rate was 27 per cent with 73 per cent of the patients improved.

SUMMARY AND CONCLUSIONS

In this paper we have presented a review of 144 cases of lung abscess, some of which were treated surgically and some nonsurgically. We make no attempt to prescribe any definite method of treatment for lung abscess but in these conclusions present some facts found in our series of cases which we consider worthy of note.

1. A precise localization of the abscess is very important in determining the method of approach in cases in which surgery is contemplated. X-ray examination and bronchoscopy are particularly useful in this respect. In our series the most prevalent site of the abscess was the right lower lobe, the next the left lower lobe, and the next the right upper lobe.

2. Forty-one abscesses developed after tonsillectomies and 27 after abdominal operations, all performed under general anesthesia and most of them under ether. In 23 per cent of our cases in children lung abscess was caused by aspiration of a foreign body.

3. In cultures of sputum material obtained by bronchoscopic aspiration and the material from the abscess itself, we found both aerobic and anaerobic organisms. Pneumococci were most frequently found and less often Staphylococcus aureus, fusiform bacilli, hemolytic streptococci, micrococci, catarrhalis, etc.

4. In regard to symptomatology, we found the earliest and most frequent symptom was cough, dry at first and later becoming productive. Of our patients 88.6 per cent had foul sputum, 11.4 per cent had odorless sputum, and 57.8 per cent had hemoptysis. Chills and fever were found in 90 per cent of the cases and chest pain in 94 per cent.

5. In the cases reviewed, 154 were male and 90 female, 208 adult and 36 children. The

average age of the adult patients was 35.9 years and the children ranged between 1 month and 13 years.

6. The average duration of the disease in these cases presented was 1 year. This factor is to be considered when the type of treatment to be prescribed is selected.

7. We consider the following as possible preventives of lung abscess following surgery: (a) good care of teeth, gums and throat before a contemplated operation; (b) avoidance of the use of strong sedatives before and after operation because they decrease the cough reflex; (c) frequent aspiration of the trachea and bronchial tree by nasal catheter; (d) the encouraging of the patient to cough after operation; (e) early aspiration bronchoscopy in a postoperative atelectasis.

8. In acute cases the abscess should have surgical drainage as soon as it is diagnosed.

9. In some chronic cases we try conservative treatment first and if the patient does not improve sufficiently with this treatment, operation is performed.

10. We create surgical drainage by several methods depending on the location of the abscess. In cases of peripheral abscess with empyema a thoracostomy is performed with additional enlargement of the opening in the lung by cautery if necessary. We performed 17 thoracostomies for associated empyema. In cases with more deeply situated abscesses the cautery procedure described in the text was carried out, totally unroofing the cavity with resection of the overlying ribs. This procedure is performed in one or two stages depending on whether or not the pleura is adherent. When done in two stages, an interval of from 10 days to 2 weeks is allowed to elapse between stages. In all surgical procedures we use general anesthesia. Needle aspiration is helpful in accurate localization of the abscess after the pleura is exposed. We allow the pack to remain in the abscess cavity for about 3 days, changing it the first time under general anesthesia. Thereafter the pack is changed every other day and applied more loosely to allow the lung to re-expand.

In some cases in which the cavity does not heal completely and bronchial fistulas remain over a considerable period of time, we perform

a lobectomy. There are 3 lobectomies in this series and 1 total pneumonectomy.

11. The postoperative complications that we encountered were hemorrhage, spill-over empyema, septic spread of the disease involving the subcutaneous tissues of the body, kidney, spleen and brain. Bronchopleurocutaneous fistulas sometimes require plastic operation. Schede thoracoplasty or lobectomy for obliteration.

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916 6
7 M T E M M C Laryngoscope 4 34 51
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Ib d 930 68 68
Idem J Th rac Surg 104 9 431
Ib d 94 98
3 SCHLITTE S A J W 1 I F Arch 7
9 7 4 4
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VOLVULUS OF THE SIGMOID COLON

Report of Twenty five Cases

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IN the United States volvulus of the sigmoid colon is so uncommon that few series are large enough to evaluate adequately the clinical picture diagnosis and therapy of this condition. This is not true in Eastern Europe for of 215 cases of intestinal obstruction reported by Pearlman from a Russian clinic 111 or more than half were cases of volvulus. Of 10 cases seen at the Friedrichshain Hospital in Berlin Braun and Wortman list 31 cases of volvulus of the sigmoid colon. At the Cook County Hospital 438 cases of large bowel obstruction were treated between 1937 and 1945. Thirty seven of these cases were volvulus of the sigmoid colon at an incidence of 8.0 per cent. These cases comprised 2.2 per cent of all intestinal obstructions admitted. The clinical and surgical records and the x ray films in 25 of these cases of established volvulus of the sigmoid in which all the data were complete have been reviewed and constitute the basis of this report.

ANALYSIS OF CASES

Table I gives the age distribution of sex and symptoms in 25 cases of volvulus of the sigmoid colon. The following observations were made: 14 cases or 56 per cent were confined to the age group of 51 to 70 years. The sex is usually reported as predominately male and our series agrees showing an incidence of 16 males and 9 females. Although volvulus has been divided into 3 groups by Fernstrom our cases fit better into two general types: acute and subacute. Seven patients of the acute type or 28 per cent which occurred in the younger age groups had an onset that is short in duration usually about 4 hours with no history of previous attacks and an

equivocal history of constipation. All these patients experienced early emesis of a transient nature and generalized cramping abdominal pain. Eighteen patients of the subacute type or 72 per cent showed a different picture in that the condition occurred in the older age groups had a more gradual onset of symptoms with an average duration of 102 hours and consistently presented a history of previous attacks chronic constipation emesis late in the course of the disease and cramping lower abdominal pain.

In Table II the physical findings are summarized in both the acute and subacute types of volvulus. Half of the acute type showed distention audible peristalsis minimal abdominal tenderness and ability to take amounts of enema up to 1000 cubic centimeters. The x ray films in these patients indicated distention of the sigmoid due to volvulus and laparotomy revealed a sigmoid volvulus with viable bowel. The remainder of the acute type had severe distention absence of peristaltic sounds abdominal tenderness and the inability to take more than a 500 cubic centimeter enema. The flat film of the abdomen or the barium enema revealed a pattern indicative of volvulus of the sigmoid. Laparotomy confirmed these findings and showed in addition a gangrenous loop of bowel. The 2 deaths which occurred in the acute type had developed a gangrenous segment.

All the cases of the subacute type of sigmoid volvulus were characterized by severe abdominal distention. Marked tympany and audible or visible peristalsis were also absent. Abdominal tenderness was a variable finding. The enema test was for the most part consistent in that 76 per cent of the patients were unable to take more than a 500 cubic centimeter tap water enema introduced under the force of gravity. The patients who were able to take

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Cook County Hospital School of 31

TABLE I—SYMPTOMS ACCORDING TO AGE DISTRIBUTION

Age groups	0-20	21-40	41-60	61-80	81-100	101-120	121-140	141-160	161-180	181-200
Number of cases										
Percentage of cases										
Sex—male										
—female										
Onset	Acute	Acute	Acute	Barium	Barium	Barium	Barium	Barium	Barium	Barium
Age of onset in hours										
Previous attack	0	0	0	0	0	0	0	0	0	0
Emesis—1	0	0	0	0	0	0	0	0	0	0
—2	0	0	0	0	0	0	0	0	0	0
General abdominal mps—	0	0	0	0	0	0	0	0	0	0
Low	0	0	0	0	0	0	0	0	0	0
Clinical picture	0	0	0	0	0	0	0	0	0	0

N—Present

O—Absent

more than 500 cubic centimeters were in the class of incomplete volvulus and the enema return was always incomplete as some of the solution was caught in the twisted loop. It was seldom necessary to use the barium enema to make the diagnosis. However in those few cases in which on examination of the gas pattern on the flat film of the abdomen doubt

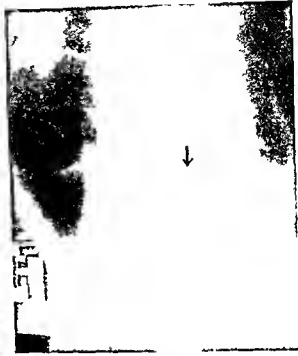
TABLE II—PHYSICAL FINDINGS IN TWENTY FIVE CASES OF VOLVULUS OF SIGMOID

	Volvolus case	S. barium case	P
D	0—moderate		
—severe		5	
Tympany	7	5	
Peristalsis—visible			20
—audible	6		
—absent			
Abdominal tenderness—rebound			20
—rebound			20
—absent			
Enema return—cubic centimeters			20
—500 less			
—500 more			25
—500 more			
Very erect abdomen—flat film			20
—barium enema			20
Gangrene			25
Visible bowel			

still existed as to the diagnosis the pattern of the barium enema was conclusive. Gangrene was present in half of the cases of the subacute type. The mortality rate was 50 per cent but was unrelated to the gangrene since an equal number succumbed with a viable bowel as with a gangrenous bowel. The overall mortality for both types was 40 per cent.

The acute type follows the course of a fulminating lesion and therefore the same marked prostration that is associated with volvulus elsewhere in the gastrointestinal tract. Because all of these patients have early transient emesis, cramping abdominal pain with tenderness in all the quadrants of the abdomen and some fever their symptoms may be mistaken for an inflammatory intra-abdominal lesion. The following case is cited as representative of this type:

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 a m h w d th cr mp g b l m al
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 what h had eat Th mps th be m g
 e I d lth gh th y w r les At 100
 m h took m f rves t m l cat Th
 pa n th becam q t re lth pat t w
 take b m d p t t bed At 100 p m h leg
 t m t cl a f th y m t lth th d d t c t
 od B 600 p m th pa h l b e m p p r r r
 l d th pat t l c i l t g t t e
 ho-p tal



t g \ t t t 8 h r s l t l t t t
l l t t t d e d g m d l o c p y g t h g b t
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f g k t h t l l D t
h t t t t t t t t t t t t t t t t t t
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l h y s l m i n a t n r l l c l r d (n a l
h a p e r l c u t l i l T m p e t r a 9 9 6 J
g 4 j r t 2 2 p u l 8 8 b l l r
6 8 6 l l r l i m n a l t l d 3 c t m t e
b o t h x y b j l n T h g n l
b l m l t n l t h b l t d n e s
S m g l t y t e n t L e r l l n
m h l l t l t u n l w j m h d m a k
d l l w t t r u c t n t J h j a t t
a n l l t r t i n t a j t r a A t l m l
t h l i m l l n n m g a l l l l o j
g r e s t t g m l t l (F g) A g
g l f g m l t l 3 6 0 l g r t t t
f t t p e a t n d w t r t l b t t
z a t (M k l) j o c l T h j t t m l a n
t f l r

Obstipation for a day is followed by a dis-
tended abdomen and gas pains below the na-
vel relieved by flatus. The tendency is for the
attacks to become more frequent until com-
plete obstruction end the patient to the
physician (12). The following case illustrates
the subacute type of sigmoid volvulus.

C D 53 l l c o l c l m a n s n
a m l u l t p t i t h a d m t t e i t t h j i t l
t h t h l l g m p l i t S h s t t d t a t 8
h t u l h e n t e l a c r m g g b i m n a l
p m o d a t n l r a n i l c a t e d u j a p u b c a l l y
t h l a b i m n S h t k o m e m i n e a l l f r
l f T h p a h n n e l t m t t t
t a l u t h u f t r t h t t p p e l A n h
l t t h p i n c u r r e d t h t m l e t t t h l f t
t r q l t T h s p a a m c h t h m a
l l l l l t g i n n t r c u g b t
v o t 3 m n t a l l g b o t m u t s
T h p a n t h n l j t h g h t t h e n t l
l l m n a n l b o t g h u r s f t r t h n t f t h
p a t h t t n t n e d t h t h b i m b e
g n g t l l 2 n t y f h u r s a f t t h n t
t h j a t n t h a l a b o l m m e n t p g l g
a m n t l l s l f t T h j t t t t h

In contrast to the acute fulminating type of
ileon d. cr. d. there is the more commonly
seen type of sigmoid volvulus which we have
called subacute. The great majority of these
patients were ambulant through out the course
of the disease despite the tremendous disten-
tion of their abdomen and a complaint of only
moderate discomfort. The symptoms are at
first attacks of partial obstruction of the colon



TABLE III—OPERATIVE RESULTS IN CASES OF VOLVULUS

Type of lesion	Number of cases	Initial condition	Result
1st	8	All patients had long sigmoid loops	—1 died of shock —1 died of sepsis —1 died of pulmonary embolism —1 died of peritonitis —1 died of shock —1 died of shock —1 died of shock
2nd	1	—Recurrent	—Necrotic —Hemorrhagic —Perforated —Recurrence —1 died of shock —1 died of shock —1 died of shock
3rd	1	—Cecostomy —Perforated —Hemorrhagic —Perforated	—Cecostomy —Perforated —Hemorrhagic —Perforated
4th	4	—Cecostomy —Perforated —Hemorrhagic —Perforated	—Cecostomy —Perforated —Hemorrhagic —Perforated
5th	1	—Cecostomy —Perforated —Hemorrhagic —Perforated	—Cecostomy —Perforated —Hemorrhagic —Perforated
6th	1	—Cecostomy —Perforated —Hemorrhagic —Perforated	—Cecostomy —Perforated —Hemorrhagic —Perforated



attempted to correlate the surgical procedure and its sequelae. In 11 patients were treated by a Mikulicz (11) procedure. Of these 6 were treated by this method as the initial procedure. One patient had a cecostomy 15 days previously and 1 patient had a simple detorsion then a recurrent attack and a lateral anastomosis and on the third recurrence an exteriorization and resection of the markedly redundant sigmoid loop. Three patients expired and in all 3 gangrenous bowel was present.

Six patients were treated by simple detorsion with 1 death. Of these 3 patients had recurrent attack 1 of which was relieved by conservative therapy 1 by a lateral anastomosis between the proximal and distal sigmoid loops. 1 patient was not relieved by conservative therapy and expired.

Five patients were treated by a Rankin true resection (14) with a fatal outcome in 1.

In 4 patients the diagnosis of large bowel obstruction was made and they were treated

by a McNealy cecostomy (10). They did not respond to this therapy. Two patients died and of the 2 who survived cecostomy one required a Rankin obstructive resection 24 hours later for gangrenous bowel and the other was partly relieved by the cecostomy only to become completely obstructed requiring an exteriorization procedure 15 days later.

Two patients were treated by conservative method of oil and enema routine in the knee chest position because they refused operation. One of these recovered but he had a recurrence of his volvulus 2 years later and expired.

One of the most significant findings in this review of the operative and nonoperative therapy of volvulus of the sigmoid colon is that volvulus is a lesion with a marked tendency to recur doing so in 20 per cent of the case and necessitating further operative procedures and being associated with a mortality of 40 per cent.



Fig 6 I distal cut set f h d u
 Flail h th maled g f d t u f th g
 m dlop h h oc pes th u bd m l ly
 Ar m k th po t f th l s

DISCUSSION

Since volvulus takes place by rotation of the loop around its mesenteric axis it requires of course a mobile loop of sigmoid (9) Trues considers chronic constipation an important etiological factor. All writers stress the increased length of the intestinal loop involved and many attach significance to a vegetable diet among the Russian and Siberian people. In our series there was no incidence of vegetable dietary abnormality. Rather we found that there was a constant finding of chronic constipation and cathartic habit. These factors could produce hypertrophy of the sigmoid colon in length breadth and thickness while the mesenteric base remained the same. Such condition might predispose to volvulus. Brehm observed an abnormally long sigmoid flexure to be more frequent in male than in females. Another possible explanation of the difference in sex frequency offered by Wangensteen (8) is that the more relaxed abdominal wall and roomier pelvis in the female is more apt to

favor spontaneous rotation if a twist occurs. Other etiological factors which we have observed at laparotomy include (1) a fall in either congenital or due to an clipper tonitis or due to previous attack of volvulus with hemorrhage into the mesentery and healing with scar formation causing a secondary contraction of the base of the mesentery (6).

Bloodood give an interesting and reasonable explanation of the mechanism of volvulus. He believes that a distal colon distended habitually with feces will develop a thickening of its wall. This phenomenon can be verified in resected specimens. The sigmoid wall is found to be thickened up to 1 centimeter in spite of a tremendous amount of acute distention. The base of the mesentery in such case is relatively narrow and the condition is spoken of as a contracting mesentery. This contraction draws the base of the mesentery of the proximal and distal portions of the sigmoid to ether thus enabling it to be more easily twisted. Constipation and fermentation with the formation of gas and the consequent distention lifts the sigmoid loop up into the abdominal cavity and as the proximal sigmoid dilates it becomes more tense because of its fixed attachment with the descending colon. Meanwhile the lower portion of the sigmoid and the upper part of the rectum which are less fixed rise and as the least resistance is to the left the distended lower portion of the sigmoid and rectum move in that direction. The upper portion of the sigmoid moves down to the right and the volvulus is produced with a clockwise mesenteric twist. Such twist was found to be present in the 6 case of which a record of the direction of the volvulus was kept. But since in 19 other cases the direction was not noted the evidence is still inconclusive.

The greatest incidence of volvulus of the sigmoid colon occur in middle and advanced years. In 119 cases collected in the European literature Giffhorn observed the following age distribution. Of 108 cases of volvulus of the sigmoid 46 cases were in the age group of 31 to 50 year and 40 cases were in the age group of 51 to 70 years.

Determination of the capacity of the colon by the use of a tap water enema has long been

considered as a sign of diagnostic importance in mechanical obstruction of the large bowel. The normal capacity of the colon in an unobstructed adult is usually 2 to 3 liters of water. The inability to introduce 500 cubic centimeters of water points to the presence of sigmoid volvulus (17). This diagnostic finding was present in the majority of cases but when the volvulus of the sigmoid is incomplete 3 liters of water may be introduced into the redundant loop. However, it has been our experience that when this occurs the patient can expel only a small portion of this amount. Since only 24 per cent of the patients showed this valve like action, it cannot be regarded as a pathognomonic findings as has been claimed by some authors.

Tenesmus and bloody mucus in the rectum have been reported as not being infrequent but was present in only 1 of our cases.

Of great diagnostic significance is both the flat x ray film of the abdomen and that following the use of barium enema. We wish to call special attention to the rather typical gas pattern of sigmoid volvulus as is demonstrated in Figures 1, 2 and 7. In all these cases which vary in duration from 24 hours to 5 days, it is quite evident that the tremendously dilated sigmoid loop is situated in the right side of the abdomen and there is moderate distention of the colon beyond it. These findings are classical roentgenographic evidence of sigmoid volvulus (8). Rigler and Lipchultz state that the diagnosis of sigmoid volvulus is made by the demonstration of a double point of obstruction, the size and position of the sigmoid loop and the presence of unusual amounts of fluid. From the evidence of the roentgenograms in our own series the presence of an unusual amount of fluid appears to be an atypical and coincidental finding. Even in these cases in which there was neglect in treatment for 4 and 5 days no x ray evidence of an abnormal amount of fluid within the bowel was found.

Figures 1 and 7 demonstrate that x ray film after a barium enema reveal a normal mucosal pattern in the sigmoid and rectum distal to the dilated loop. The upper end of the spade, however, comes to a sharp point and produces the appearance of an



Fig 7. Volvulus of sigmoid colon. The dilated sigmoid loop is situated in the right side of the abdomen. The upper end of the spade, however, comes to a sharp point and produces the appearance of an

spade (7). The only lesion that may simulate this picture is obstruction due to tumors but in these cases there is usually a ragged stenosis coexistent with the lesion. Thus from the examination of the flat x ray films of the abdomen and in doubtful cases of the films following a barium enema the diagnosis of sigmoid volvulus may be made with a reasonable degree of assurance.

Treatment of these patients on the general surgical service at this hospital has been associated with a mortality of 40 per cent. Perthes reports a mortality of 39 per cent and Pearlman reported a mortality of 46 per cent. Metheny in his study of the problem recommends the routine conservative use of enema to relieve the obstruction but admonishes that this should not be persisted in too long. The signs of detorsion are the passage of large amounts of feces and flatus but this detorsion gives no assurance that the volvulus will not recur. Simple untwisting of the volvulus by this method or by surgical intervention has

been found to be inadequate because the underlying pathological condition has not been affected. Attempts to perform a lateral anastomosis in the presence of an unprepared distended bowel have been admittedly quite unsuccessful even though these patients may be completely decompressed at the time of surgery by the routine use of two rectal tubes which are threaded up into the redundant sigmoid and attached to a suction apparatus. Our data indicate that an exteriorization procedure executed in the presence of a viable bowel gives the best recovery rate. If a gangrenous bowel is present resection is obligatory but even in the cases of viable bowel secondary resection following the exteriorization procedure seemed to be the operation of choice.

SUMMARY AND CONCLUSION

1. There are two main types of sigmoid volvulus.

Acute (7 cases) characterized by occurrence in the younger age groups, short onset, equivocal history of constipation, early transient emesis, generalized cramping abdominal pains, abdominal tenderness, acute distention and marked prostration. These patients tend to develop gangrene early and run a fulminating course.

Subacute (18 cases) characterized by occurrence in the older age groups, of a more gradual onset of symptoms, history of previous attacks and constipation, and emesis late in the course of the disease. These patients tend to develop gangrene slowly and run a more moderate course.

Seventy-six per cent of the patients were unable to take an enema of more than 500 cubic centimeters.

3. The single most helpful aid was x-ray examination. The typical roentgenographic findings are tremendously dilated sigmoid loop situated in the right abdomen, moderate distention of the colon above the volvulus, absence of a collection of fluid within the bowel, absence of pades appearance of the barium enema opacity, normal mucosal pattern in the sigmoid and rectum distal to the dilated loop.

4. Volvulus of the sigmoid tends to recur and therefore simple detorsion is not the treatment of choice.

5. Exteriorization and second stage resection give the best results.

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THE SIGNIFICANCE OF TUMOR CELLS IN SEROUS EFFUSIONS

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THE study of the physical, chemical, bacteriological and cytological characteristics of fluids obtained from body cavities has long been recognized as a valuable diagnostic procedure. Many times clinicians ignore another diagnostic examination which may be carried out on aspirated fluids. This is the study of sediments from fluids for malignant cells. The results of examining effusions in the following reported cases emphasize the importance of this procedure as a diagnostic aid and prognostic guide.

The identification of neoplastic cells in exudates has been attempted for many years. Zemansky cited Beale as the first to recognize carcinoma cells in exudates. Beale in 1860 found malignant cells in sputum from a case of carcinoma of the pharynx. In 1875, Quincke published the first study on cells in smears made from peritoneal and pleural fluids. From that time on the literature has contained reports of numerous series of cases in which stained smears were examined for tumor cells. Zemansky has published an excellent review of this work, and the reader is referred to his article for a review of this literature.

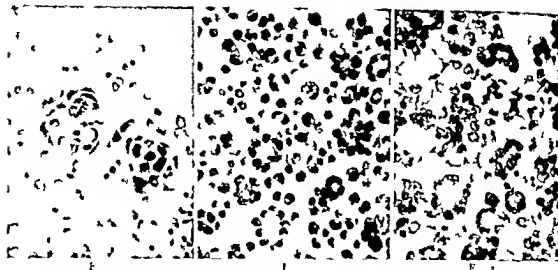
The earlier reports were based on smears made directly from the body fluids. Bahrenburg in 1895 was the first to use sections of sediment remaining after decantation of supernatant fluid. Mandelbaum described a simple technique of using sediment after centrifuging the original fluid. Several modifications of this method have since been developed. The advantages of sectioned sediment are that the cells may be studied in a natural relationship one to another and that the chance of finding small groups of epithelial

cells in tissue sections is greater than in study of direct smears. The appearance of cell groups is important since identification of carcinoma from individual neoplastic cells is most difficult. A large amount of fluid should always be used if available. There are occasions when only a few cells or groups of cells are present and the more fluid used the greater is the chance of observing them. However, typical carcinoma cells may be found in only a few cubic centimeters of fluid.

The technique used in making the histological preparations presented here is simple and follows the method of Mandelbaum. The fluid is allowed to settle by gravity by standing overnight in the icebox. The clear upper layer is poured off and the cloudy sediment is centrifuged at 3000 revolutions per minute in a wide tube measuring 3 by 7 centimeters for a 20 minute period. The supernatant fluid is decanted and 10 per cent formaldehyde added to the sediment. This mixture is allowed to stand for 18 to 24 hours when the formaldehyde is poured off. By this time the sediment has hardened and the resultant button can be gently removed with a small scalpel. An effort is made to remove the sediment in as nearly one piece as possible. It is then run through acetone, alcohol and chloroform paraffin embedded in paraffin, sectioned and stained with hematoxylin and eosin.

Examination of the smears. There are varied views as to the criteria on which a diagnosis of malignant growth can be made. Some investigators base a diagnosis of carcinoma on the appearance of individual cells. Emphasis is placed on such characteristics as the presence of mitotic figures, variations in the nuclei and the presence or absence of vacuoles. Foot and Quensel have stated that the diameters of the nucleolus and the nucleus are important and that the nucleolus to nucleus ratio is high in malignant cells. Zemansky reported that the presence of mitotic figures is pathognomonic

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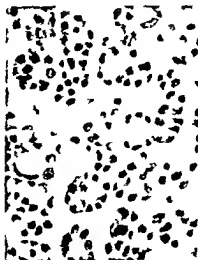
F 2 S t f d m t f l l l f d
f the t g m d \times_3
F 2 S t f d m t f m p e d l f d

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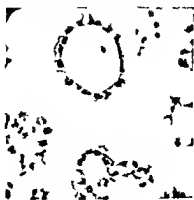
of carcinoma. However Karp and Foot have shown mitotic figures in mesothelial cell Zeman's criteria for the recognition of tumor cells are the finding of fragments of tissue with definite arrangement of the cells in acinar or papillary formation the presence of multiple groups of large deeply staining cells and the finding of fine cellular changes such as eccentric nuclei or mitotic figures. Foot found

acini or papillae in 15 per cent of his cases metaplasia in 43 per cent mitosis in 26 per cent and multinucleation in 63 per cent. The diagnosis of neoplasm may be confused by the presence of mesothelial pleural pericardial and peritoneal covering cells. Schlesinger in a study of fluid taken from 100 patients made a diagnosis of carcinoma only after finding groups of cells whose arrangement left no doubt as to their epithelial nature.

In the cases here reported the diagnosis of carcinoma was based primarily on the findings of tumor cells arranged in pseudopapillary



F 4 S e t f e d m t f m p e t l f d p p l
l r v d o c a t i s \times_3



F 5 S e t f e d m t f m p e t l f d
m l t h r v i x \times_3

settes or papillae. In a few cases cells were found in cord or in solid groups and the variation in size shape and chromaticity was such that the diagnosis of malignant neoplasm could be made without reservation. Several illustrative cases with accompanying photomicrographs are presented.

CASE 1. A 67 year old white male physician was admitted to the University Hospital because of ankle edema abdominal swelling and pain in the right arm. A paracentesis had been performed the day before admission and the paracentesis diagnosis was portal cirrhosis. On the day of admission the patient suffered a spontaneous fracture of the right humerus. Examination on admission revealed marked pitting edema of the lower extremities, dyspnea abdominal swelling crepitation around the right upper arm and evidence of pleural effusion. Carcinoma was then suspected and confirmed by finding tumor cells in sections of sediment from the abdominal fluid. The patient died a few days after admission. Postmortem examination was permitted and a adenocarcinoma of the rectosigmoid was found with metastases to the peritoneum and pleurae.

The section (Fig. 1) shows two groups of cells. These cells are arranged in irregular solid groups. The cells vary in size shape and chromaticity. Although the section represented does not show mitoses too clearly, their sections presented numerous mitotic figures.

CASE 2. A 42 year old white female was admitted because of recurrent attacks of upper abdominal pain, nausea and vomiting of 6 weeks duration. The patient had a radical mastectomy for adenocarcinoma of the breast $2\frac{1}{2}$ years before admission. A distended abdomen moderate dyspnea and light colored enlargement were found on examination. A few days after admission the patient developed a paracentesis and other signs of malignant ascites. A pericardial tap was done and 250 cubic centimeters of blood fluid removed. Shortly after removal the patient died and permission for autopsy was not granted. The diagnosis from statistical carcinoma was made in the examination of sediment from the pericardial fluid.

The section (Fig. 2) shows numerous red blood cells lymphocytes in necrotic and isolated mesothelial cells. There are present many clumps of atypical epithelial cells arranged in pseudocords and rosettes. The cells vary in size shape and chromaticity and occasional mitotic figures can be seen. The cells are irregularly placed in the acinar group.

CASE 3. A 66 year old female entered the University Hospital because of loss of weight anorexia and constipation in the month of duration. A gastrointestinal series made in the hospital demonstrated a possible pyloric lesion. Examination

revealed a tender mass in the left lower abdomen and evidence of fluid in the right pleural cavity. A thoracentesis was performed and malignant cells were found in the fluid. The patient was discharged with the diagnosis of inoperable carcinoma of the colon.

The section represented in Figure 3 presents numerous large pyknotic epithelial cells arranged in acini and rosettes. The acinar formations vary considerably in size. The epithelial cells are inconstant in size shape chromaticity and are irregularly placed in the acinar groups. These sections are compatible with carcinoma of the colon.

CASE 4. A 55 year old white female was admitted because of dyspnea ascites nausea vomiting and loss of weight. These symptoms appeared after the patient had been discharged from the hospital 2 months previously. The discharge diagnosis was lymphogranuloma ascites and pleural effusion the latter of undetermined etiology. An abdominal paracentesis had been performed but the fluid was not examined for cells. Eight years before the initial admission the patient had undergone a bilateral salpingo-oophorectomy and hysterectomy. This as done in another hospital and the reports on the surgical specimens could not be obtained. At the time of the latest admission dyspnea abdominal distention marked pitting edema of the lower extremities and bilateral pleural effusion were found. An abdominal paracentesis and a thoracentesis were performed and adenocarcinoma was found on the examination of both fluids. The patient expired after a rapid downhill course. At autopsy a rectal stricture with granuloma and papillary adenocarcinomatosis with pleural and peritoneal metastases were found. The site of the original malignant lesion was not satisfactorily determined.

The section shown in Figure 4 represents a section from the peritoneal fluid. Irregular cells with hyperchromatic nuclei of various sizes arranged in pseudoacini and papillae are seen. This arrangement was also found in samples of pleural fluid and in a biopsy specimen of a nodule which appeared on the abdominal wall following the paracentesis. Probably if the abdominal fluid had been examined at the time of previous admission the diagnosis could have been made then.

CASE 5. A 41 year old white female was first admitted to University Hospital because of irregular vaginal bleeding. Pelvic examination had disclosed erosion of the cervix and several biopsy specimens taken on the outside had been reported as benign. Another biopsy specimen taken in the hospital had been reported as squamous carcinoma. The patient was given radium therapy and discharged. A week later she was readmitted because of abdominal swelling. At this time a small mass was palpated in the region of the left ovary. A paracentesis was performed and a diagnosis of papillary adenocarcinoma was made from sections of the sediment. The patient was considered inoperable and died a few weeks later. Autopsy was not permitted.

TABLE I —INCIDENCE OF MALIGNANT CELLS IN PUNCTURE FLUIDS

Clinical diagnosis	No. of cases	Type of fluid examined in cases				Cases in which malignant cells were found	Cases in which malignant cells were not found	Percentage of cases in which malignant cells were found	Confirmatory		Percentage of confirmed cases with malignant cells
		Pleural	Pericardial	P. cal	P. ar dial				Cases confirmed	Cases unconfirmed	
Carcinoma of breast						8		7			77
Carcinoma of lung	3					6				6	
Lymphoblastoma	7					3					60
Hypernephroma											
Carcinoma of rectum	3							00			00
Carcinoma of esophagus								00			00
Carcinoma of adenomum								00			00
Carcinoma of pancreas								00			00
Carcinoma of bladder								00			00
Carcinoma of gall bladder								00			00
Carcinoma of stomach		4		5		6		66.3	8		
Carcinoma of liver	6			6				66			
Carcinoma of cervix											
Carcinoma of uterus											00
Carcinoma of ovary		3				8		3			66
Total		3		3					6		

TABLE II —INCIDENCE OF MALIGNANT CELLS IN PUNCTURE FLUIDS

Clinical diagnosis	No. of cases	Type of fluid examined in cases				Cases in which malignant cells were found	Cases in which malignant cells were not found	Percentage of cases in which malignant cells were found	Confirmatory evidence		Percentage of confirmed cases with malignant cells
		Pleural	Pericardial	P. cal	P. ar dial				Cases confirmed	Cases not confirmed	
Pulmonary tuberculosis		6								3	
Lung abscess											
Tuberculous peritonitis											
Pulmonary infarction											
Atypical pneumonia											
Pneumothorax										5	
Cystic fibrosis											
Unknown						3				3	
Total						29					

The results presented in Figure 5 show that the percentage of malignant cells found in the fluids was 77% in carcinoma of the breast, 66% in carcinoma of the lung, 60% in lymphoblastoma, 0% in hypernephroma, 0% in carcinoma of the rectum, 0% in carcinoma of the esophagus, 0% in carcinoma of the adenomum, 0% in carcinoma of the pancreas, 0% in carcinoma of the bladder, 66.3% in carcinoma of the stomach, 66% in carcinoma of the liver, 0% in carcinoma of the cervix, 0% in carcinoma of the uterus, and 66% in carcinoma of the ovary.

SUMMARY OF RESULTS

From 1934 to 1944 17 samples of fluid aspirated from 14 patients have been examined for malignant cells. The technique and the diagnostic criteria discussed were used

in all cases. Carcinoma was suspected in all of the 14 patients at the time the fluids were examined and the study of the sediments was regarded as a means of establishing or confirming the diagnosis. In 51 of the 14 cases the diagnosis at death or discharge was not carcinoma. The negative diagnosis was confirmed in 40 cases by autopsy or exploratory laparotomy. In 91 patients carcinoma of some form was the final diagnosis at death or discharge.

TABLE III—RESULTS OF REPEAT EXAMINATIONS

Location of carcinoma	Type of fluid examined	Repeat examinations					Confirmatory tests
		1st	2nd	3rd	4th	5th	
Chest	Pleural	+	do	+			Negative
Lung	Pleural	+	4 days				Aspirate
Lung	Pleural	—	7 days	—			Confirmed
Lung	Pleural	—	week	+	week	—	Brother's microscope
Tes. 1	Pleural	+	4 days	+			Operative
L.	Pleural	+	ks	+			Aspirate
Lymphoblastic	Pleural	—	k	—			Not confirmed
Rectum	Pleural peritoneal	+	3 ks	+			Aspirate
Lung	Pleural	—	week	—			Not confirmed
Stomach	Pleural	—	week	+			Negative
Chest	Pleural	+	5 days	—			Biopsy
Stomach	Pleural peritoneal	+	3 weeks	+			Negative
Stomach	Pleural	—	week	+			X-ray
Rectum	Pleural	—	3 days	+	k	—	Aspirate

In 41 of the 14 patients fluids aspirated on two or more occasions were examined. This procedure was carried out because the results of the first examination did not agree with the clinical diagnosis or because the diagnosis was still uncertain. In 7 of these 41 cases the final diagnosis was not carcinoma. Table III shows the results of re-examinations of fluids from the 14 cases of carcinoma. In 5 cases neoplastic cells were found in both original and repeat examinations. In 2 cases in which a positive report was obtained in the first examination repeat reports were negative. Of the 7 cases in which no cells were found in the original studies in 4 instances malignant cells proved to be present at subsequent observations. These results indicate that repeat examinations of puncture fluids are warranted and are sometimes essential to correct diagnosis. When carcinoma is suspected clinically a negative original report is not conclusive and more fluid should be examined if possible.

COMMENT

Clinicians are sometimes disappointed when the pathologist fails to find carcinoma cells in fluids obtained from patients in whom the diagnosis of carcinoma has been confirmed by roentgen or operative examinations. This is

especially true in primary carcinoma of the lungs in which a low percentage of positive fluids was reported. From the observations in Table II this low incidence can be explained. Of 8 cases of pulmonary carcinoma in which studies of the pleurae were possible only 3 were found to have pleural implants and in all of these 3 cases the pleural fluids contained malignant cells. The effusions in cases of primary carcinoma of the lung are largely due to venous obstruction with transudation or to pleural irritation and exudation caused by inflammatory reactions secondary to primary growth in the lung. Pleural implants occur in less than one third of the cases.

Many times abdominal and pelvic surgery is attempted even in the face of positive pathologic reports on abdominal fluid in the hope that no peritoneal implantation has taken place. The results which have been discussed shatter this hope and the finding of cells indicates that serosal implantation has probably occurred and surgery is of only palliative value. The prognosis is extremely poor in those patients in whom neoplastic cells are reported in puncture fluids.

SUMMARY AND CONCLUSIONS

In these cases of suspected carcinoma with effusion the diagnosis of carcinoma was

tablished or confirmed by examination of the sediment in 45 per cent of the cases

Malignant cells were found in nearly 60 per cent of fluids from cases of confirmed carcinoma

A positive report of malignant cells is indicative of carcinoma but a negative report is not conclusive

When malignant cells are found in effusion fluids chances of having serosal implants are great (95%) prognosis poor and operation is inadvisable except as a palliative measure

Effusions in those cases of confirmed carcinoma in which no cells are found may be due to venous obstruction and pressure effects

A definite diagnosis of carcinoma should be based on sections containing groups of cells

arranged in definite acinar or papillary formation

Repeat examinations are essential when the diagnosis is still uncertain

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EXPERIMENTAL STUDIES IN PERIPHERAL NERVE SURGERY

IV The Effect of Infection on Regeneration and Functional Recovery

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IN a previous article¹ we presented a study of the healing of gunshot wounds involving peripheral nerves and were able to show that the majority of the wounds which were not chemotherapeutically treated became grossly infected. However the extensive changes produced within the nerve and the delayed recovery of function were to a large extent the result of the nature of the injury and not directly related to infection. In order to study the direct effect of infection on nerve repair and regeneration the sciatic nerve of 79 animals was sectioned and repaired under septic conditions. None of the ordinary aseptic precautions were observed: the shaven skin was not cleansed and the operation was performed with unwashed hands and unsterile instruments, silk sutures, gauze and cotton sponges and skin clip. Some of the wounds became grossly infected and developed abscesses and phlegmons; the resulting septicaemia ended in the death of 15 animals. The wounds of the other animals were all contaminated even though no abscess formed. Bacterial cultures taken at the end of the operations showed a definite growth of *Staphylococcus albi* and *Bacilli protei*. Cultures of the purulent material of the infected wounds revealed a predominating amount of nonhemolytic streptococci, *Staphylococcus albi*, *Bacilli protei* and spore forming gram positive aerobic rods.

The sectioned nerve was repaired by end to-end suture in 16 animals by the transplantation of contaminated autogenous grafts in 32 animals and of contaminated homogenous grafts in 31 animal. The infection which developed in these contaminated

wound formed abscesses 4 to 5 days after nerve repair. When the abscesses were not drained the animals died 7 to 14 days later. No animals died of sepsis in the group of contaminated end-to-end sutures. Following transplantation of contaminated autogenous grafts 4 of 32 animals died of sepsis and 11 of 31 contaminated homogenous grafts died of sepsis. No death occurred in either of the latter groups when sulfonamides were used locally in the wound at the time of nerve repair.

In most instances the nerves were found intact; the sutures were holding and the grafts were intact as they crossed the abscess cavities. Skin, subcutaneous tissue and muscle underwent partial liquefaction and necrosis long before the nerve became involved. However these nerves were sutured before the infection became active; the site of nerve repair was practically healed when the abscess formed and it became necessary to perform a more critical experiment to study the reaction of a nerve suture in a previously grossly infected field. In 12 animals the bed of the exposed sciatic nerve was infected with purulent material obtained from the abscess of another animal and the nerve was then sectioned. Two days later the abscess which had developed was drained, the wound debrided, the nerve end trimmed, end-to-end suture performed and the wound closed. Six of these animals died of the result of the sepsis before the nerve could be sutured; that is within 2 days after implantation of the purulent material. In the other 6 animals the nerve was satisfactorily sutured. Of these 3 specimens were removed after 14 days and the other 3 were allowed to recover for several months. At the time of removal of these nerves a large amount of adhesions was encountered which immobilized the nerve at the site of the suture.

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Chicago, Ill. 5

When these adhesions were dissected away the nerve was found intact and resembled any other nerve repaired by primary end-to-end suture. Cultures taken from these virulent abscesses showed a heavy growth of non-hemolytic streptococci, Staphylococci albi and Bacilli protei.

The gross appearance of the nerve and the suture lines was about the same 30, 45, 60 and 75 days after repair in end-to-end sutures, autogenous and homogenous grafts. It corresponded to the description given in a previous article¹ of the aseptic series. However, the adhesions between the suture lines, the grafts and the surrounding tissues were slightly more extensive and denser and the suture lines were more prominent. The grafts appeared to be thicker at the time of removal than at the time of transplantation and were slightly more voluminous than in the aseptic series and this was especially noticeable in the homogenous grafts (Figs. 1, 2, 3).

Microscopic studies showed, depending on the age of the specimen, the same characteristics of degeneration and regeneration as previously described for the aseptically repaired nerves. The regeneration of nerve fibers, the formation of axis cylinders, myelination and organization of the myelin decomposition products showed no appreciable differences from those findings in the aseptic group. However, in most of the septic animals a very strong epineural cellular and fibrous reaction was present after 30 and 45 days and persisted for 60 and even 75 days. This reaction produced the appearance of a chronic perineuritis and small lymphocytic foci were often encountered around the silk sutures and within the epineurium and interfascicular perineurium. In the end-to-end suture group this epineural reaction extended 1 to 2 centimeters proximal and distal from the suture line and was accompanied by a marked epineural proliferation. In the autogenous grafts neurotization was equally as good in the septic as in the aseptic grafts provided no severe infection took place. Lymphocytic foci were found in the suture lines, the epineurium and the interfascicular perineurium but no signs of inflammation or infection were present

within the nerve fascicles. The chronic perineuritis did not interfere with nerve regeneration. The strong mesodermal reaction which took place in the epineurium produced diffuse adhesions between the epineurium and the surrounding muscles. In the presence of a severe infection a complete necrosis of the graft occasionally took place and sometimes a necrosis of the axis cylinders of the central nerve segment was also observed. Following necrosis of the ectodermal and the mesodermal tissues the original graft structure was replaced by a neuromatous type of tissue so that the organization and the later neurotization of the graft were essentially heteromorphous in type. Thus severe infection complicated the internal graft structure and interfered to a certain degree with the outgrowth of the regenerating nerve fibers. These however ultimately reached the distal suture line and the distal nerve segment where they followed their normal isomorphous course to their end organs. Although the histological structure of aseptically transplanted homogenous grafts was predominantly heteromorphous, this type of organization and neurotization was still more accentuated in the septic grafts. Severe infections increased the degree of necrosis of the graft and led to a more pronounced heteromorphous organization. Chronic lymphocytic foci were frequently found throughout the proliferated epineurium and perineurium even 150 days after the operation and in some cases lymphocytic infiltrations were also present around the capillaries within the nerve fascicles. However, these chronic inflammatory processes did not interfere with neurotization.

The reaction of the nerve suture line and the graft to infection was more clearly seen in the nerves which were repaired after an abscess had already formed or which crossed an abscess cavity. It was interesting to study the reaction of the nerve severed within the abscess before it was sutured. Two days after section the nerve fascicles of the distal and proximal stumps were surrounded by infected perineurium and epineurium which contained numerous abscesses and were in a state of lively mesodermal proliferation. No attempt at nerve regeneration had yet taken place in

the proximal segment. The infected granulation tissue which had proliferated completely sealed off the open endoneural tubes of the proximal and the distal nerve segments and no evidence of infection or inflammation was present within the nerve fascicles. Regeneration will thus be greatly delayed and impaired.

Fourteen days after suture in the infected field purulent infected and hyperemic mesodermal tissue surrounded the epineurium which contained scattered small hemorrhages. Some suture abscesses were present but no inflammatory foci were seen within the nerve fascicles where regeneration had already taken place. The same picture was present 21 days after suture. Autogenous grafts removed from an abscess cavity 7 and 14 days after transplantation showed the same inflammatory epineural and perineural reactions to infection but no such changes had taken place within the nerve fascicles. Homogenous grafts removed from abscess cavities 6, 9, 17 and 21 days after transplantation were completely necrotic. Suture abscesses were present. Lymphocytic and leucocytic infiltrations, hemorrhages and histiocytic proliferation had taken place in the epineurium and the perineurium. Considerable hyperemia accompanied by perivascular lymphocytic infiltrations and hemorrhages were also present within the nerve fascicles. It was interesting to note that the living nerve i.e. the proximal and distal nerve segments was protected against inflammatory processes whereas the necrotic homogenous graft took part in the infection in spite of the mesodermal reaction. Thus the effect of severe infection was worse in homogenous than in autogenous grafts. Living nerve tissue is protected from infection by its epineurium and perineurium which proliferate and keep the infection from entering the nerve fascicles.

FUNCTIONAL RECOVERY

End to end sutures. There were no differences in the sequence and the rate of recovery between the septic and the aseptic groups of animals. Motor recovery as tested by stance gait and voluntary motion of the leg muscles appeared around the 45th day after suture and motion in the dorsiflexors of the toes was seen

in only one animal of each group after 60 days. Obvious muscular contractures were found in one septic animal which lived 618 days and in which all movements could be elicited. Muscle atrophy was present in all animals its degree varied widely but there were no differences between the septic and the aseptic groups. It was most marked 30 days after suture and diminished as recovery progressed. Some signs of sensory recovery to pain and deep pressure in the foot were present in the septic as well as in the aseptic animals after 60 days. A heel ulcer was present in one of the septic animals 45 days after suture. A reflex fanning of the 5th toe was obtained in one septic animal after 60 days. Direct electrical stimulation of the nerve above and below the suture line with an alternating 60 cycle current produced a plantar flexion of the foot in all animals after 45 days and a plantar flexion of the foot and toes and dorsal flexion of the foot in all the animals after 60 days. There were no differences in response between the septic and the aseptic groups.

One aseptic and two septic animals were allowed to recover for 2 years. One of them in which the sciatic nerve was sutured within the field of an abscess showed complete motor sensory and trophic recovery after 8 months while the other two still had a marked weakness of the dorsiflexors and the adductors of the toes when sacrificed.

Autogenous grafts. There were no significant differences in the sequence and the rate of functional recovery between the septic and the aseptic groups of animals. In all the animals of this group as well as in those with homogenous grafts the distal suture line was resected and resutured 45, 60 and 75 days after transplantation of the graft. It was found that in the relatively short grafts used in these experiments the resection of the distal suture line of the graft did not delay or facilitate the return of function as will be shown in a later article. For this reason when reference is made to 90, 100 or 50 day old grafts the signs of recovery were tested 45, 60 and 75 days after secondary suture of the distal suture line.

Gait and stance began to recover with a lifting of the heel 90 days after transplanta-



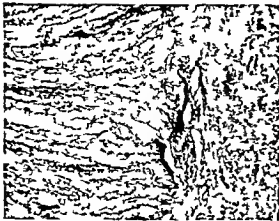
Fig 1 11 1 t 45 d ys ft pe t h g d l t dhes
 bo l h t h g r ft 60 d y ft t p l a t t Th dh
 Fig 2 Spl d h g ft l th d t t t l p e s e t
 Fig 3 Sept h g ft 6 d y ft t p l t t h g l g
 Th dh t f d l t h dh d th t g l t d both l h es
 e d f f c u l t d e c t a y l both t r t l g d

tion of the graft and after 120 days some animal stepped on the plantar surface of the toes while others still continued to step on the dorsal surface of the toes when walking. Recovery of toe drop was however more marked after 130 days. Obvious muscular contractions were seen in 3 animals with autogenous grafts 2 of them after septic operation. One was present 133 days and the other 163 days after transplantation they involved in both instances the extensor digitorum longus. One of them had a large persistent trophic ulcer of the heel which was present 60 days after transplantation. Heel ulcers were present in the 4 septic and 1 aseptic autogenous grafts and 4 of them occurred after secondary resection and resuture of the distal suture line of the graft. Muscle atrophy was present in all animals varying widely in range and diminishing in the older grafts. There were no differences between the septic and aseptic group.

Beginning sensory recovery was found on the lateral aspect of the foot in septic as well

as in aseptic animals 120 days after transplantation of the graft. This applies also to response to pressure of the toe pads. No fanning or step reflexes could be elicited in this group of animals even 163 days after grafting of the nerve.

Direct electrical stimulation of the nerve above on and below the graft produced plantar flexion of the foot in 80 per cent dorsiflexion of the foot in 100 per cent and plantar flexion of the toes in 40 per cent of the animals 90 days after transplantation of the graft. After 120 days plantar flexion of the foot and toes was present in 100 per cent dorsiflexion of the foot in 50 per cent and fanning of the toes in 25 per cent of the animals and after 130 days plantar flexion of the foot was present in 80 per cent plantar flexion of the toes in 40 per cent dorsiflexion of the foot in 80 per cent dorsiflexion of the toes in 60 per cent and fanning of the toes in 20 per cent of the septic animal. The average score of the total response to electrical stimulation was about the same in septic as in aseptic ani-



F 4 S d d f th t l m t f th
t d y ft se t thu b ty
D g t d r p t sh f t d
beg ll f t Th t d lt bes d
led ff by p lf t d f t d sod m ll h h
g f th pe t th g p l bet
lh t l d d t l e d Th nf l d d t
pe t l t th f c l (Bod f h ta
X ∞)

mals after 90 days 44 per cent for the septic and 43 per cent for the aseptic after 10 days 33 per cent and 57 per cent and after 130 days 36 per cent and 64 per cent respectively

Homogenous grafts More differences between the aseptic and the septic series were present in this group of animals than in the autogenous grafts and the end to end sutures

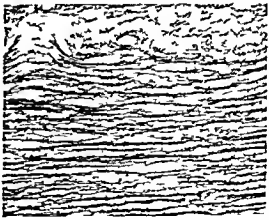


F R t g r f t r s c g th t l
4 d y ft l g ly f ct d h ld Th y f ll
th p th f tgr g b l t d ll fibers
A t bsc ss p t b l th th k d pe
r m t th bott f th ph t 1 h (Bod
f h ta X 300)

This may be due to the more extensive necrosis and greater vulnerability of the homogenous graft in the presence of infection and the resulting more complicated pattern of organization and regeneration. No recovery in stance and gait were observed in the first 73 days after transplantation of the graft. Lift ing of the heel when standing began to recover after 90 days. After 120 days only 23 per cent of the animals showed some recovery a



F 6 C ss sect f nf ted r 4 d ys aft
t h lscs th th p d d by t pe
ta t f sc l h h t d t bed by th p es-
m Th r f sc l t d t bed by th p es-
ce f th d nfect (bodian f chs tain
X)



F Sept t gr ft 4 l ys ft t pl
ta h t l t bscs d
l m t f my l d mpo t p od t bet ee
them Th m ked p lf t f th pe m
b t en f f th th f sc l (Bod
f chs tain X)

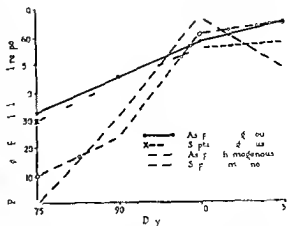


1 g 8 Sept h mog x ft m 1 f m b-
 sc ty d ys ft t pl tat Th
 f sc l filed th l dec mpo l p od t
 h h g l pe sc l l y n hocy t f t t
 A od l be f g l g r v f l e r s h o
 f se t Th l l y p e r l t l t h l
 f se cul pe d f o c f l y p h c y t (Bod f h
 ta X 9)

compared to 80 per cent in the aseptic series and after 150 days the heel drop was recovering in 50 per cent of the septic and 100 per cent of the aseptic animals. Toe drop or walking on the dorsal surface of the toes was present in all animals after 150 days.

Infection had no influence on the development of muscular contractures. Of the 6 cases with obvious contractures 2 belonged to the septic and 4 to the aseptic series. They were present 120 days after transplantation of the graft and involved mostly the extensor digitorum longus. Infection had no influence on the development of heel ulcers; neither was the formation of heel ulcers associated with muscular contractures or an increased amount of adhesions around the nerve. Heel ulcers occurred in 3 of 17 animals examined. Muscle atrophy was present in all animals and there was no difference between the septic and aseptic groups. After 90 days the gastrocnemius oleus muscle group had lost 70 per cent to 80 per cent of its weight; after 10 days this loss of weight varied between 50 per cent and 62 per cent and after 150 days it decreased to about 40 per cent.

A critical recovery of pin sensation was found after 150 days in either the septic or aseptic group. In 2 year old experiments complete return of sensation was found in



both groups. Step reflex of the foot and fanning reflex of the toes were late signs of recovery. They were not seen in homogenous grafts after 150 days but were present 2 years after implantation of the graft in both groups.

There was no response to direct electrical stimulation of the nerve or the graft during the first 75 days after transplantation. After 90 days plantar flexion of the foot was obtained in 75 per cent dorsiflexion of the foot in 25 per cent and plantar flexion of the toes in 50 per cent of the septic animals. After 10 days plantar flexion of the foot and toes and dorsiflexion of the foot was present in 100 per cent and dorsiflexion of the toes in 5 per cent of the animals. After 150 days this percentage dropped to 65 per cent for plantar flexion of the foot and toes and dorsiflexion of the toes and to 35 per cent for dorsiflexion of the foot.

The accompanying chart shows in percentage the average score of total electrical response for all the animals in the septic and aseptic autogenous and homogenous grafts. The discrepancy between the percentage curve of the septic and aseptic homogenous grafts may be related to the severity of the infection in individual cases and the relatively small number of animals with septic homogenous grafts that were studied.

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SUMMARY

Infection at the site of repair of a severed peripheral nerve increases the amount of ad



Fig 4 S d d f th t l g m t f th
t t d y ft t th b t m ty
D g t d p t h f t m d
beg g ll l f t Th t d l t b
l d ff by p l f t d f t d m od m l t h h
g f m th p m t th g p t bet
th t l d d t l Th feet did t
pe t t t th f l (Bod f h t
X 100)

mals after 90 days 44 per cent for the septic and 43 per cent for the aseptic after 120 days 53 per cent and 57 per cent and after 150 days 56 per cent and 64 per cent respectively

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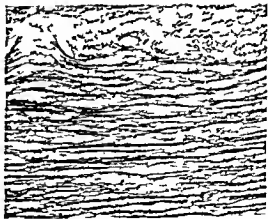


F 5 R t t fib g th t l
4 d y ft t g ly f t d h ld Th y f l
th p th f tgr g t b l l t l l f l e
l t b ss p t b l th th k d pe
n m t th b t t m f th ph t ph (Bod
f ch t X 300)

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Fig 6 C o s e t f f ted r 4 d y aft
t h b s c e s s th t h
t t f s c l h h d d by ta per
n m Th f s c l t d t bed by th p es
f th d n f e c t (Bod an f h s tam
X)



F 7 S p t t g ft 4 l y s ft t pl
tati h m t l f b e l
l g m t f y l d p o t p o d t bet ee
th m Th m k e d p l f t f th pe m
b t n f f e c t thi th f s c l (Bod
f h s i t a i X)

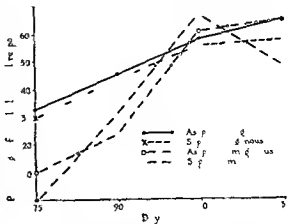


Fig 8 Sept h m g g ft d f m b-
es ty d y ft t t t Th e
f sc l fll l th my l d mpo t p od t
h h g d pe sc l y phocyt fll t
t ad t be t g t g fibers l
t se t Th d eum hyperpl t l th t
h h g f n d f d d t m h
t X 9)

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SUMMARY

Infection at the site of repair of a severed peripheral nerve increases the amount of ad-



Fig 1



Fig 3



Fig 4

Fig 1: a Tb f k s f t m k e d t
f l l y t h g t l t k
Fig 3: Th f j d k j t f f b l o o d l y m p l g

po g d th f g t p Th ls op des t t
I k 4 O p e t d f t h m t t
f t f p p o e d f l a p d g t l t k

dead space will result in the coccygeal zone because the gluteal fat cannot enter the defect.

This operation is a plastic operation. The handling of the flap with ordinary surgical instruments is to be avoided and fine hooks or guy sutures alone should be employed.

Hemostasis must be perfect and only very fine plain catgut is permissible (No 00000) as a ligature material. Four or five mattress su-

tures of fine silk pass through the skin and fat of one side about $\frac{1}{4}$ inch from the skin edge pick up the sacral ligaments and emerge through the fat and skin of the flap (Fig 16).

It is important to ensure that the suture when tied will draw a quantity of the fat of the flap into the dead space. These sutures are placed and left long but not tied as they are subsequently employed to fix an anchor

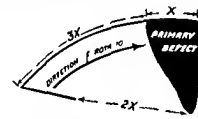


Fig 5



Fig 6

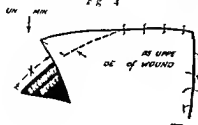


Fig 7



Fig 8

SURGERY GYNECOLOGY AND OBSTETRICS

TABLE I—SUMMARY OF 5 CASES

Case No.	Degree of inflammation	Pain	Position	Comments		Findings
				Local	Systemic	
1	Acute inflammation	Frontal	Da	N.I.	N.I.	Red, swollen
2	Discharge	N.I.	Da	N.I.	N.I.	Red, swollen
3	Discharge	N.I.	Da	N.I.	N.I.	Red, swollen
4	Discharge	N.I.	Da	N.I.	N.I.	Red, swollen
5	Discharge	N.I.	Da	N.I.	N.I.	Red, swollen
6	Discharge	N.I.	Da	N.I.	N.I.	Red, swollen
7	Discharge	N.I.	Da	N.I.	N.I.	Red, swollen
8	Discharge	N.I.	Da	N.I.	N.I.	Red, swollen
9	Discharge	N.I.	Da	N.I.	N.I.	Red, swollen
10	Discharge	N.I.	Da	N.I.	N.I.	Red, swollen
11	Discharge	N.I.	Da	N.I.	N.I.	Red, swollen
12	Discharge	N.I.	Da	N.I.	N.I.	Red, swollen
13	Discharge	N.I.	Da	N.I.	N.I.	Red, swollen
14	Discharge	N.I.	Da	N.I.	N.I.	Red, swollen
15	Discharge	N.I.	Da	N.I.	N.I.	Red, swollen
16	Discharge	N.I.	Da	N.I.	N.I.	Red, swollen
17	Discharge	N.I.	Da	N.I.	N.I.	Red, swollen
18	Discharge	N.I.	Da	N.I.	N.I.	Red, swollen
19	Discharge	N.I.	Da	N.I.	N.I.	Red, swollen
20	Discharge	N.I.	Da	N.I.	N.I.	Red, swollen
21	Discharge	N.I.	Da	N.I.	N.I.	Red, swollen
22	Discharge	N.I.	Da	N.I.	N.I.	Red, swollen
23	Discharge	N.I.	Da	N.I.	N.I.	Red, swollen
24	Discharge	N.I.	Da	N.I.	N.I.	Red, swollen
25	Discharge	N.I.	Da	N.I.	N.I.	Red, swollen
26	Discharge	N.I.	Da	N.I.	N.I.	Red, swollen
27	Discharge	N.I.	Da	N.I.	N.I.	Red, swollen
28	Discharge	N.I.	Da	N.I.	N.I.	Red, swollen
29	Discharge	N.I.	Da	N.I.	N.I.	Red, swollen
30	Discharge	N.I.	Da	N.I.	N.I.	Red, swollen
31	Discharge	N.I.	Da	N.I.	N.I.	Red, swollen
32	Discharge	N.I.	Da	N.I.	N.I.	Red, swollen
33	Discharge	N.I.	Da	N.I.	N.I.	Red, swollen
34	Discharge	N.I.	Da	N.I.	N.I.	Red, swollen
35	Discharge	N.I.	Da	N.I.	N.I.	Red, swollen
36	Discharge	N.I.	Da	N.I.	N.I.	Red, swollen
37	Discharge	N.I.	Da	N.I.	N.I.	Red, swollen
38	Discharge	N.I.	Da	N.I.	N.I.	Red, swollen
39	Discharge	N.I.	Da	N.I.	N.I.	Red, swollen
40	Discharge	N.I.	Da	N.I.	N.I.	Red, swollen
41	Discharge	N.I.	Da	N.I.	N.I.	Red, swollen
42	Discharge	N.I.	Da	N.I.	N.I.	Red, swollen
43	Discharge	N.I.	Da	N.I.	N.I.	Red, swollen
44	Discharge	N.I.	Da	N.I.	N.I.	Red, swollen
45	Discharge	N.I.	Da	N.I.	N.I.	Red, swollen
46	Discharge	N.I.	Da	N.I.	N.I.	Red, swollen
47	Discharge	N.I.	Da	N.I.	N.I.	Red, swollen
48	Discharge	N.I.	Da	N.I.	N.I.	Red, swollen
49	Discharge	N.I.	Da	N.I.	N.I.	Red, swollen
50	Discharge	N.I.	Da	N.I.	N.I.	Red, swollen

TABLE I—SUMMARY OF 5 CASES—Continued

Case	Disease	Period	Postoperative	Complications		Follow-up
				Local	Systemic	
1	Recurrent abscess	10	Unfavorable	Small abscess	Small abscess	Small abscess
2	Discharge	10	Day	Small abscess	Small abscess	Small abscess
3	Discharge	10	Day	Small abscess	Small abscess	Small abscess
4	Discharge	10	Day	Small abscess	Small abscess	Small abscess
5	Discharge	10	Day	Small abscess	Small abscess	Small abscess

dressing One to two grams of sulfanilamide powder are dusted into the wound

A second series of similar mattress sutures lying between the first series are inserted but pick up each skin edge and are tied as inserted. We stress this precaution because accurate apposition of the cutaneous edges is very important (Figs 17-18). It is essential to see that the dead space is closed at the tip of the coccyx as this point may be overlooked. These sutures are continued along the upper border of the flap to close the buttock wound.

At the re-entrant angle of the flap 2 cubic centimeters of plasma (group O) and 2 cubic centimeters of thrombin topical are separately inserted. On occasions we have mixed 1000 to 15000 units of penicillin with the plasma. The flap is lightly compressed to ensure spreading of the solutions and held for 1 minute until the fibrin forms. An assistant now maintains pressure on the flap until the secondary defect is closed. With small flaps direct suture suffices (Fig 18). The delicate fibrin lamination of the flap should not at this stage be disturbed by rough suturing or other manipulation. Hemostasis has thus been most satisfactorily effected in our cases—an important prophylactic against hematoma formation under the flap which has been our most frequent complication of this method.

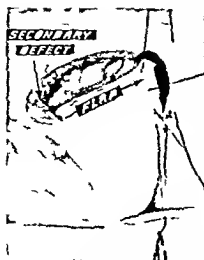
With large flap the secondary defect is more extensive and requires a Z-plastic (Figs

18-19). Where the rotating re-entrant angle overlaps the upper border of the wound a Z-flap is cut the angle being let into the upper border and the relaxation of the upper edge now permits closure of the wound (Fig 14).

The anchor dressing is tied in place and no further wound dressing is employed. A superficial pad is fixed in place with elastoplast. The patient is permitted to lie on his back if he so desires. The bowel are opened as soon as the patient begins to experience any abdominal discomfort. The anchor dressing is removed on the twelfth day and the patient is kept in bed for 21 days. A careful watch



Fig 5. The first incision is made at the re-entrant angle of the flap. The second incision is made at the re-entrant angle of the flap. The third incision is made at the re-entrant angle of the flap.



F 6



F 7



F 8



F 9



F 10



F 11

F 6 Etl d t t fl p des ned d d
p ocess f t t bed N t th ec d r d fect
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F o Zpl t p t mpl t d
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t t Clos hy tat d p H l g b p m y
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must be maintained for the occurrence of a hematoma under the buttock flap. Should this occur and be overlooked infection may supervene. The natal cleft has healed by first intention in 18 of our last 21 cases and remained healed. Hematoma occurred under the buttock flap in 6 cases but not in any case in which fibrin fixation was employed. In cases the hematoma became infected and drained streptococcal pus for 10 days but was readily controlled with local penicillin therapy.

The method was employed recently to close a trophic infected sacrococcygeal ulcer of 2 years duration resulting from a gunshot wound of the cauda equina with anesthesia of the third, fourth and fifth sacral segments. Local penicillin therapy was used prophylactically for 14 days. Healing occurred by first intention.

The resiliency and firmness of the flap at the third month have been striking in the cases which have been followed up for that period. Some patients complain of tenderness of the flap for a few weeks but the majority state that no symptoms exist.

The method is presented in the hope that those having access to a large number of cases will afford it a fair trial. As with all plastic procedure, a careful and meticulous technique pays large dividends.

SUMMARY

1. The irregularity of the embryonic epithelium of the natal cleft and the persistence of natal dimples in young adults supports the theory that pilonidal sinuses are tubular invagination of the natal cleft.

2. The very high incidence among service personnel suggests that the vigorous and unhygienic conditions of service life may be important contributory factors.

3. The growth of the sinus into the fascia of the natal cleft is described. The anatomical disposition of this fascia governs the primary spread of the sinus.

4. The natal cleft possesses a poor blood supply derived mainly from small medial twigs of the posterior perforating arteries from the sacral foramina. Secondary tracks of the sinus may enter the buttock along these twigs.

5. In all except the smallest operative defects closure by direct suture is inadvisable because the rigidity of the buttock fascia prevents free approximation in the subcutaneous wound.

6. A method is described which has a wide application, avoids tension, introduces a new blood supply and permits restoration of the natal cleft. The pitfalls of the method are emphasized.

7. The difficulties and travail experienced in 4 cases of large infected pilonidal sinuses treated by this method are epitomized.

1. The irregularity of the embryonic epithelium of the natal cleft and the persistence of natal dimples in young adults supports the theory that pilonidal sinuses are tubular invagination of the natal cleft.

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LACERATIONS OF THE PERINEUM AND THEIR REPAIR

A Study Based on 2375 Personal Cases

LOUIS E. PHANEUF, M.D., S.D., F.A.C.S., B.S., M.S., Ch.S., St.

LACERATION of the perineum is one of the commonest lesions in gynecology. With the exception of the few cases which may be due to external trauma this disorder is the result of childbirth and occurs during the passage of the fetal head through the vagina and the vaginal outlet. The repair of the damaged birth canal has led to a voluminous literature and to the proposal of many operative procedures some of which are ill advised.

Lacerations of the perineum are divided into recent lacerations or tears seen at the time of childbirth and old or remote lacerations in which healing has been left to nature and scar tissue has formed between the edges of the torn structures. Those of the first group are known as obstetrical lacerations of the perineum and are divided into three degrees. In the first degree only the mucosa of the vagina is involved and the perineal muscles escape. In the second degree the vaginal mucosa and perineal muscle are involved. In the third degree the vaginal mucosa, the perineal muscles, the sphincter ani muscle and not infrequently the rectovaginal septum are included in the process. Lacerations of the second group comprise the so-called gynecologic lacerations. They are referred to as incomplete when the tear extends through the perineal body but not through the sphincter ani muscle and rectovaginal septum, and as complete when the two last mentioned structures are damaged.

The gynecologist and surgeon also have to deal with still another form of injury to the pelvic floor, namely the relaxed vaginal outlet in which there was no apparent external tear at the time of childbirth but separation of the muscular and fascial structures existed under the intact mucosa and skin. This disorder is usually accompanied by protrusion of the rectum between the separated support planes. This protrusion is referred to as a rectocele and lies in line with the loss of support.

Repair of the lacerated perineum or damaged pelvic floor may be classified as immediate, inter-

mediate and late repair or perineorrhaphy. Primary repair is carried out at the time of childbirth and should be done wherever the surroundings are suitable. Injuries to the pelvic floor are generally sutured in hospital deliveries. The current practice of episiotomy or incision of the perineum extensively employed during the last two decades has prevented the jagged and multiple lacerations which were encountered before this simple measure was adopted. A straight incision placed by the obstetrician where he wants it to be is simpler to suture than an irregular tear and the result obtained is far superior to that of the irregular tear which may occur when conditions are left to nature.

Improvement in the repair of recent injuries to the pelvic floor has come through the improvement of suture material in general and by the use of fine suture material. Nowadays a strand of No. 0 chromic catgut is found to be adequate in suture pairs where formerly a strand of No. 2 chromic catgut was used. The involved planes of the pelvic floor are approximated in layers, the keynote being accurate approximation without tension. The mass approximation of all structures with large nonabsorbable threads and through sutures which leads to a firm resistant frequently painful and thick perineal body is not practiced by well trained operators. When such a method has been employed it is not unusual to find painful ridges or scars across the skin as the result of sutures too tightly tied. Opinion is divided as to the proper method of closing the skin in an episiotomy or recent repair of the perineum. There are those who advocate the use of fine catgut in the form of a subcuticular stitch, continuous suture, loose set or interrupted sutures and those who believe that interrupted sutures of fine silk prepared in nylon, the so-called absorbable material add a sense of security since it not infrequently occurs that the fine catgut sutures constantly bathed in the lochia absorb prematurely and cause separation of the skin edges before healing has been completed. Episiotomies are described as median when the incision is made in the perineal body, the median line and as midlateral and lateral right or left when the incision is placed on one side of the other of the median line. Since the epis-

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more tension on the edges of the lateral incision than exists in the median fine silk or nylon sutures offer a certain advantage in closing the laceration in the former type of incision. The repair of recent injuries of the perineum is usually very satisfactory if in tying the deep sutures tension has been avoided.

Intermediate repair of recent perineal injuries has never attained much vogue and has had but little place in the obstetrician's armamentarium since most lacerations and incisions are repaired at the time of childbirth. However there are occasions when the condition of the parturient because of a long exhausting labor hemorrhage difficult delivery and poor surroundings for performing immediate repair makes it inadvisable to reconstruct the perineum at the time of the delivery. In this group of patients the choice rests between intermediate repair and the performance of a gynecologic operation 3 months or more following parturition after the perineum has been allowed to heal by scar tissue. Intermediate repair is commonly carried out 10 days after childbirth. The parts are repaired with a nonirritating germicidal solution, the granulation tissue is curetted from the torn edges and approximation is carried out by means of loosely tied sutures of fine catgut in the deep tissues and those of nonabsorbable material in the skin.

The late repair of lacerations of the pelvic floor with or without accompanying rectocele is performed by the gynecologist or surgeon when healing of the torn tissues has taken place by scar tissue and an involution of the involved structures after parturition has been accomplished. It is a wise plan to allow at least 3 months to elapse after childbirth before such an operation is attempted. Neglected lesions, perineal lacerations and a relaxed vaginal outlet with concomitant rectocele and enterocele, not infrequently come to the gynecologist or surgeon many years after the original accident. As in 1 or even 50 years sometimes having elapsed in my experience. Furthermore perineorrhaphy is seldom performed as a single operation rather it is performed in connection with other operations for prolapse in connection with hysterectomy and with other gynecologic interventions.

An examination of the nulliparous perineum reveals that it is elastic gives adequate support and is not painful to sphincter. In reconstructing the pelvic floor the operator should aim in so far as possible to restore the parts to their original form. This purpose can be accomplished by layer approximation with tension of the tissues and by the employment of fine suture material it is defeated

by the approximation of all the structures in one layer by large nonabsorbable sutures.

TECHNIQUE OF SECONDARY PERINEORRHAPHY

Having previously described and illustrated the technique of the operation for complete tears of the perineum as I perform it (1, 2) I will limit my description at this time to the technique of performing late or secondary perineorrhaphy for incomplete tears.

Preoperative preparation. Two nights before entering the hospital the patient takes a saline cathartic in the form of magnesium sulfate or sodium phosphate or solution of citrate of magnesium. After the bowels have been thoroughly evacuated she remains on a light diet until admission. The afternoon before operation the external genitalia are shaved and gently scrubbed with gauze and tincture of green soap particular attention being paid to the anus so the folds about the vulva and to the mons veneris. The parts are then rinsed with sterile water and with nonirritating potassium mercuric iodide solution 1:1000. A vaginal douche is given consisting of 2 drachmas (8 gm.) of compound zinc sulfate powder (National Formulary VII) in 2 quarts (2 liters) of warm water. A soap suds enema is administered the afternoon or evening before operation but not on the morning of operation. After the induction of anesthesia the parts are prepared in the operating room by cleaning the external genitalia with ether and painting them with tincture of zephiran and by painting the vagina with tincture of zephiran. In the presence of considerable vaginal discharge the vulva and vagina are gently scrubbed with tincture of green soap and warm water rinsed with 1:1000 potassium mercuric iodide solution and painted with tincture of zephiran. The sterile drappings are applied and the anus is covered with a sterile gauze sponge which is held in place by means of two towel clips.

Operative procedure. A self retaining perineal retractor is used to spread the labia apart. Preference is given to the Friedman type of retractor but if this is not available a Gelpi retractor may be used. Another satisfactory method of exposing the parts consists of using fine silk sutures held in hemostats on each side of the vulva and at the posterior commissure. The advantage of using self retaining retractors is that this leaves the hands of the assistants unencumbered. The pelvic floor is opened at the mucocutaneous border. This may be done with Emmet's scissors (Fig. 1) Mayo scissors or a scalpel. The posterior margin of the incision is held in the median line with an All



F 2



F 3



F 4



F 5

Fig. 2. A line drawing showing a surgical dissection of the perineal area. It depicts the rectum, the levator ani muscle, and the perineal muscles being separated. The drawing is labeled 'F 2' at the bottom.

forceps and the posterior vaginal wall is separated from the rectum and the perineal muscles by sharp and blunt dissection using the gauze covered fingers (Fig. 2). In the illustration for greater clarity the gauze is not included. Figure 3 shows this part of the dissection almost completed and Figure 4 shows the completed dissection. The separation of the posterior vaginal wall from the rectum and the perineal muscles is facilitated by using a T forceps which holds the

vaginal wall firmly and does not slip. The perineum is then reconstructed by approximating four layers of tissue. The crus of the pubococcygeus muscles which are attached to the levator ani muscles are approximated in the median line by three interrupted sutures of No. 3 chromic catgut to narrow the space between the two medial margins of the levator ani muscles and to overcome the ectocele (Fig. 5). The second layer comprises the urogenital diaphragm made up of the deep



Fig 5

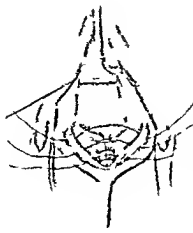


Fig 6

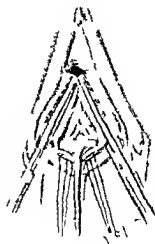


Fig 7

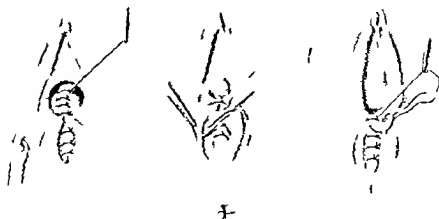
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m e s e s d t h t e d l m g f th t t
m e s e s d t h t e d l m g f th t t

ch m t g t a p l e d n th tal d phrag
d p f th d f t t t t t t t t t
h l d h t t t t t t t t t t t
f g 7 Th e s f th post n g l l
c t e d t h f m f t g l th t t t t t
f th rectoc l Och l p e d t h h s d Th
Och t t t p t t t t f th f l p l l

transversus perinei muscle and its covering fasciae. Three sutures of the same material are placed in these structures and left untied (Fig 6). A triangle of the posterior vaginal wall with the apex at the crest of the rectocele is resected. When there is considerable redundancy, this is facilitated by the use of Ochsner clamps on each side, but they may be omitted if the opposite condition exists (Fig 7). The vaginal part of the incision is closed with interrupted sutures of No. 00 chromic catgut (Fig 8) and the three sutures in the urogenital triangle are tied and cut. The skin edge is freed from the underlying scar tissue so that it can be approximated later without tension, an important desideratum when fine catgut is used in the skin (Fig 9). The third layer consisting of Colles fascia is united with a continuous suture of No. 00 chromic catgut (Fig 10). The skin forms the fourth layer and is approximated with a running suture of No. 00 chromic catgut, the ends of which are arrested with clips. At the lower angle of the skin incision there is always columnar tissue which if not removed appears as a protuberance. It is important to resect this tissue in order to leave a flat surface when the suture is completed (Fig 11). At the completion of the operation of perineorrhaphy the only part that shows is the 2.5 to 5.0 centimeters of skin

which covers the operative field. Many operators pay little attention to this skin and in closing it leave dog ears, uneven surfaces and a protuberance at the lower angle of the incision. Using lead shots instead of tying the sutures and resecting the skin at the lower angle of the incision results in a flat, even surface giving a satisfactory plastic result. The vagina is loosely packed with iodoform gauze, the end of which is held by a silk suture attached to the inner aspect of the thigh by a small piece of ahesive plaster. This step in the procedure greatly facilitates the finding of the gauze for removal at the end of 24 hours (Fig 12).

Postoperative care. Morphine and codeine are prescribed in sufficient amounts to allay pain. The suture line is painted with 4 per cent aqueous mercurochrome or aqueous solution of zephiran after each micturition and defecation. Forty-eight hours after operation a mild douche of compound zinc sulfate powder (National Formulary VII) 1 drachm (4 gm.) in 1 quart (1000 c.c.) of warm sterile water is given, and this treatment is repeated daily as long as the patient remains in the hospital. A No. 22 French male soft rubber catheter is used as a douche tip. If catheterization is necessary in the first few days after operation, great care should be used in separating the labia



F 8 The p t r e l l l ed th t rupted t es f h m t
 F 8 Th Lu p t d f m th d h g c r t s s o a t m l l t
 f m th l u n e d g e s A B d P l b l d e d th d s e t
 F t C l l e s f e c p p m t e d b y t t f o o h o m t t

to expose the urinary meatus since the upper part of the incision is held by fine catgut sutures and may separate if force is used. The bowels are moved on the third postoperative day. A fairly generous diet is given on the fifth postoperative day. The patient is allowed out of bed on the morning of the twelfth day and is discharged from the hospital on the fourteenth day after operation.

R pat f l c t r y n f m l l t
 th m s a t e c d d g r t
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367
 9
 77

Results. All these patients obtained satisfactory perineal support. During the days when large suture material was used there was separation of the superficial tissues in a small group of cases; the exact number of which was not determined. In these patients healing was by second intention.

Mortality. In this series of 2328 cases there were 14 deaths, 1 gynecologic and 13 obstetric; a gross mortality of 0.6 per cent. The detail of these deaths are given in the following case summary.

GYNECOLOGIC DEATHS

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Case 4 Ope u perf med M y 3 93
 c ns ted f d u c a l u f c y s t o c l d p e c o r r h y
 Th p t u t d i e d M y 5 f p l m n a r y m b o l

STATISTICS

From May 97 to June 30 944 app oxi-
 mately 7 years I have operated on 328 women
 for lacerations or incisions of the perineum. In
 this series there were 156 gynecologic or sec-
 ondary operations on the perineum and 77 ob-
 stetric or primary operations.

The gynecologic or secondary repairs were clas-
 sified as follows:

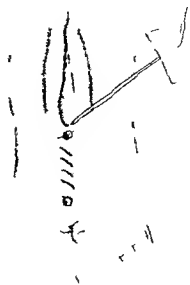
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 l f t h u f t h p e r i m

N of
 cases
 448
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 6

The obstetric repairs were classified as follows:

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N of
 cases
 6
 8



Fig

Fig

Fig Th k losed th ru k t f \ oo h catg t Th
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 g l h l t th a pe t f th th gh by s ll p f a th plast
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C 5 Ope t pe f ed o M y 6 03 l t f th p l p d t m Th l unt ded Oct be
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In the group of 12 patients the perineorrhaphy was done as a complement of an extensive gynecologic operation. The deaths were due to the extensive disease for which the main operations were performed rather than to the perineorrhaphy. In no case was the perineorrhaphy performed as a single operation.

OBSTETRIC DEATHS

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f tt mpted f ps rs d t t d
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nd a d ff ci y
It bel ed th t th pen h phy th bst t
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CONCLU IONS

The success of the operat on of perineorrhaphy depends on careful preparation of the operative field and the maintenance of a r d asepsis sharp rather than blunt dissection whenever feasible to

avoid bruising the tissues the approximation of the tissues in layers (we prefer four layers) rather than mass approximation since this maintains suppleness and elasticity as well as supports and avoids painful rigidity employment of fine suture material and accurate approximation of the tissues without tension and carefully planned and executed postoperative care

A series of 238 personal cases is reported in brief

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THE FASCIA OF THE DORSUM OF THE HAND

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FRANKLIN I. ASHLEY, M.D. JACK DYKES, M.D. Chicago, Illinois

THE texture, contents and relations of the fascial layers which cover the dorsum of the hand are of interest alike to the anatomist and to the surgeon. Kanavel's discussions which are essentially surgical contributed more to our knowledge of the layers and spaces of the dorsum of the hand than does any anatomical account. In a recent study of these strata and the compartments bounded by them, the present authors made observations on manual structure which now allow them to add anatomic detail to Kanavel's classical account. These will be described in detail and illustrated by selective dissections.

MATERIALS AND METHODS

The dorsal layer of the hand was studied in several specially dissected specimens and then in more than twenty-five hands in the students' laboratory. After the scheme of stratification had been established, two specimens were prepared for illustrations, one showing the layer opened from the surface inward (Fig. 1) the other depicting it as seen in cut-back section (Fig. 2).

LITERATURE

Of the various textbook accounts that of Quain is the most satisfactory. Quain, however, describes only two layers; the outer one is said to contain the dorsal annular ligament and listlessly to become continuous with the extensor tendons on the fingers; the inner layer is stretched over the intermetacarpal spaces and is adherent to the subjacent bones and interosseous muscles. These two lamellae, according to Quain, are continuous with each other in the intervals separating the tendons at the digital clefts between the two courses the extensor tendons and their beths. In other standard textbooks only the ligamentous thickening is described, mentioning none of the membranous structures.

Mason and Koch in their report on human bite infections of the hand describe the dorsal fascia about the metacarpal ganglions with peculiar reference to the problem of infection.

In Kanavel's treatise based upon sectioned and injected material, areas of interfascial space are demonstrated. Since these spaces, two in number, possess definite marginal boundaries, exulata can spread within them over the entire dorsal aspect of the hand. The more important one of these superimposed compartments is situated beneath the extensor tendons and upon the metacarpal bones and the interossei.

OBSERVATIONS AND DISCUSSION

In studies of fascial and aponeurotic strata such as those just described, the thicker layers stand out prominently on cut surfaces and appear as membranes bounding injected masses. However, the layers may be clarified by careful dissection, this procedure serving to establish continuities and to demonstrate regional differences in texture and attachment.

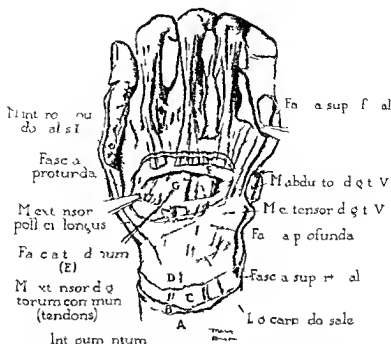
The several strata which were invariably evident in the authors' specimens will now be considered in succession from the integument to the interosseous musculature.

Integument. The integument over the dorsum of the hand and digits (Figs. 1 and 2, layer 1) is thin in a comparison with that of the palm. It is loosely attached to the underlying fascia, a circumstance which permits of considerable freedom of movement of the skin over the subjacent tissues.

Layer of superficial fascia. The superficial fascia of the dorsum of the hand is two-layered. The superficial layer is thin and somewhat fatty in consistency (Figs. 1 and 2 at B); it contains only a few vessels which pierce it on their way to the skin. In spare specimens this layer is very thin and may be separately demonstrable over the entire dorsum of the hand.

Deep layer of superficial fascia. The deeper stratum is almost always the more definite of the two. It is of uniform thickness over the entire dorsum of the hand (Figs. 1 and 2 at C). This layer transmits the superficial vessels and the cutaneous nerves. At the web of the fingers and at the margins of the hand the two layers are no longer distinct; conjoined they become continuous.

The observations reported here were made over a period of several years, during which the authors have been occupied with the study of the anatomy of the hand. The present communication is the result of a study of the anatomy of the hand, particularly the fascia of the dorsum of the hand, which was undertaken in the laboratory of the University of Illinois, Chicago, Illinois.



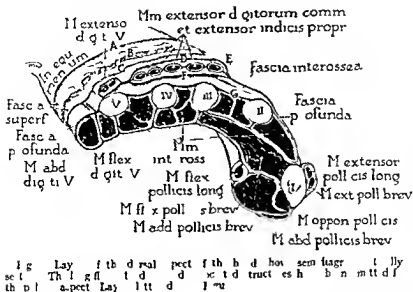
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 f ce

A clea a e plane exist between the deep layer
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 the carpal bones nd to the second d f f i t h m e
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Dorsum of the hand becomes continuous with the equivalent layer on the palm (Fig. 1 tag of fascia cut and held by forceps). Fusion of the supratendinous fascia (layer D) and the infratendinous fascia (layer F) occurs at the clefts between the fingers over the phalanges and at the sides of the metacarpal part of the hand so as to form a definite circumferential compartment (hereinafter).

Fascia of extensor tend. Under the layer just described and resting upon another equally distinct there occurs a fascial investment for the extensor tendons and their synovial sheath (Figs. 1 and 2 at E). Marginally it is a single layer but when tendons are encountered it splits to enclose them. The layer is thin yet readily dissectible. When exposed by reflection of the supratendinous fascia it appears as a fascial plate attached medially and laterally to the compartment wall. It is so distally where at each metacarpophalangeal joint it becomes part of the fibrous investment of the dorsal tendinous expansion proximally it is prolonged on the extensor tendons to become in the forearm the perimysial investment of the extensor muscles. In passing from the manual into the antibrachial region this enveloping fascia for the tendons lies beneath the dorsal carpal ligament—which latter is a locally specialized part of the supratendinous fascia—it rests upon an equally strong layer which for purpose of convenience in recording topography will be referred to as the infratendinous fascia.

Infratendinous fascia. The infratendinous fascia is the firmest layer on the dorsum of the hand

(Fig. 1 at F lifted by forceps on radial side of hand). The layer is situated next below the thin fascial envelope of the tendons. Over the carpus the infratendinous fascia is fused with the periosteum and ligaments of the carpal bones. At the level of the carpometacarpal joints the fascia becomes a distinct layer bridging the metacarpal bones. There it is fused laterally to the dorsum of metacarpal II and medially to metacarpal V. In these areas it then continues its spread marginally where in conjunction with the supratendinous fascia it becomes the investing fascia of the first dorsal interosseous and of the abductor of the fifth finger on the radial and ulnar sides of the hand respectively. On its deep aspect the fascia in some specimens is attached to the other metacarpal bones (namely III and IV) with the result that the subjacent space—between the infratendinous layer and that covering the interosseous muscles—is locally and partially subdivided into compartments.

Thus the supratendinous fascia and infratendinous layer fused along the sides and the distal extremity of the metacarpus are the walls of a compartment in which the extensor tendons are suspended by a special membranous sheet which subdivides the whole compartment into two superimposed portions. At the wrist where the outer (supratendinous) layer is continuous with the antibrachial fascia across the dorsal carpal ligament and the inner layer is continuous with the bones, ligament and articular capsules at the first joint the compartment is essentially closed through fusion of the constituent layers with the

ligamentous wall of the several canals which transmit the extensor tendons into the hand. Within these canals the tendons are covered by their separate portions of the layer which as a fascial plate splits to enclose them in the hand. Since the segregated portions are then prolonged into the forearm to become perimysial investments of the extensor muscles the fascia of the tendons would be expected to be separate from the surrounding walls of the canals. Actually, however, some fusion occurs so that the capsular dorsal compartment is not continuous with the antibrachial spaces which lie within the dorsal sleeve of fascia.

Interosseous fascia. The interosseous stratum immediately beneath the infratendinous layer and can be separated from it by blunt dissection (Fig. 1 at G lifted by hook). A loose areolar tissue sometimes containing a slight amount of fat separates these two layers of fascia. The interosseous fascia is fused with each of the metacarpal bones and is intimately adherent to the interosseous muscles which take their origin in part from its deep aspect. The layer is thin and is essentially a perimysium for the interosseous similar to that which surrounds the sacrospinalis muscle within the lumbodorsal aponeurosis and the rectus muscle within its sheath. Distally, the fascia ensheathes the tendons of the interosseous, finally reaching the dorsal tendinous expansions of the digits. In so doing it fuses with the several layers previously described which are carried outward upon the extensor tendons.

CONCLUSIONS

Conventional accounts of dorsal manual structure describe only two layers situated at subcutaneous and at osseous levels. They are termed superficial and deep fasciae. But in careful dissections of the hand a much more complex arrangement of layers is encountered related chiefly to the extensor tendons.

Both the superficial fascia and the deep fascia are bilaminar. The layers of the superficial are like the corresponding strata of the manual and other accessory fatty and membranous. The layers of the deep fascia are not wholly fatty but heavily and sufficiently banded to be considered aponeurotic. These are placed upon and beneath the extensor tendons and the latter proper fascial coat. The supratendinous layer is continuous with the antibrachial fascia in it is joined to the dorsal carpal ligament the infratendinous layer rests upon the bones of the hand. Whereas then in the forearm the deep fascia is a sleeve for the extensor muscle—between adja-

cent members of which it is sent septa in articular recesses in the hand it forms a compact investment for the tendons of the same muscles assuming the character of an envelope flattened against the metacarpal bones and intervening (interosseous) muscles. To either side of the long tendons on the dorsum of the hand these two layers of the deep fascia fuse, thus while the deep fascia is bilaminar though the greater part of its manual extent it is single layered on the ulnar and radial sides of the carpus. In the former situation it becomes the investing fascia of the first interosseous muscle while in the latter position it serves similarly for the abductor of the fifth digit. Distally the two meet at metacarpophalangeal level to close the compartment in front on the phalangeal prolongations enclose and fuse with the dorsal tendinous expansions proximally their fibrous tissue becomes part of the ligamentous tissue in the sulci on the extremities of the radius and ulna.

In the antibrachial region the extensor muscles are closely invested by a perimysial sheath. Comparably in the dorsal manual compartment (formed by splitting of the deep fascia) the perimysial tissue is broadened to produce a transverse septum which splits to enclose the extensor tendons. It is fastened at each side by attachment to the side walls of the compartment where the supratendinous meets the infratendinous layer of fascia. It is the immediate covering of the synovial sheaths.

The infratendinous layer of the deep fascia serves also as a thick sheath for the interosseous muscles. As in the structure of sheaths generally the layer next below—immediately covering the muscles—is thin. Just as the rectus muscle within its aponeurotic sheath is surrounded by a layer of perimysial nature so the interosseous below the infratendinous stratum are covered by an excessively thin fascia. On the metacarpal bones the interosseous fascia fuses with the periosteum of the carp metacarpal and metacarpophalangeal joints the layer becomes part of the capsular tissue of the articulation.

The present author would identify the superficial and deep processes of Kanavel's description as the carpal plate above and below the layers of the dorsal compartment one of these would be situated between the deep layer of superficial fascia and the supratendinous layer of the deep fascia while the other would lie between the infratendinous part of the deep fascia and the first interosseous muscles. Both of these spaces are separated from the dorsal compartment neither corresponds strictly to the

midpalmar compartment on the opposite aspect of the hand.

In the most frequent type of infection of the dorsum of the hand as described in the excellent accounts by Kanavel, Mason and Koch the synovial not the compartment could be affected. In infections caused by lacerating injuries in the carpal region however it would be expected that the synovial sheaths and the surrounding compartment would be involved. Such cases should

be studied further in relation to the arrangement of dorsal manual strata.

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3. K. V. A. B. I. feet. f. th. H. d. 7th. d. Ph. 1.
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A METHOD FOR THE SURGICAL OBSTRUCTION OF THE FALLOPIAN TUBE Animal Experimentation

EARL GEORGE KRIEG, M.D., Detroit, Michigan

A comprehensive review of the subject of surgical obstruction of the fallopian tube has shown that there has been a considerable but disturbing number of failures reported by various investigators. In each case of failure a communication has been re-established between the abdominal and uterine cavities. A number of explanations have been offered as to how this has been accomplished.

The more outstanding conservative methods in use today have favored the obstructing of the genital canal at some point in the fallopian tube. The Malleiner technique or some modification thereof was most frequently used. Resection of the cornua followed by some method of burying the distal tubal end into the surrounding tissues was second. Mikulicz and Dicksen each reported methods which produced stricture of the cornual end of the tube from within the uterine cavity which reduced these operations to an office procedure. More recently Power and Barnes have required the production of stricture of the salpinx by means of an electrode introduced through a laparoscope. The procedure of choice from the standpoint of simplicity and ease of performance is that of crushing and tying of a tubal segment. The latter authors have presented a method of segmental ligation of the mucous membrane layer in order to allow fibrosis in a relation with the highly preservative tubal piper.

The present investigation set forth primarily a simple modification of the Malleiner technique designed to eliminate the failure of closing the passage completely. Second, the study illustrated several probable causes of failure in the original technique.

The cornua of medium sized bitches compared favorably in structure with that of the human salpinx for these experimental purposes. The outstanding exception was the mucous membrane layer. In my opinion the endometrium in the log should have resisted procedures designed to produce stenosis to a greater degree than would the mucous membrane of the fallopian tube.

The method used in each experiment was composed of two procedures. First, each cornua was crushed by forceps in 2 areas, thereby forming a closed segment about 1.5 centimeters in length and a heavy silk ligature was tied firmly around the crushed area. Second, the lumen of the segment thus produced was injected with a sclerosing solution.

Nineteen animals were divided into four groups and used. With the following exceptions the standard procedure described was performed upon each cornu. In experiments Nos. 166, 167, 171, 173, 175 the segments were tied tightly without preliminary crushing. In experiments Nos. 282 and 303 an additional cornual ligature was placed distal to the tubal ligation procedure for comparison. At the end of each experiment the entire uterus was removed and laid under heavy pressure was injected into the cervix and the result was ques-



F Ph t m r r ph N 7 R est bl hm t f
l m f ll l g t th t ru h g l t d m
tr m pa u l h b u pl m t f m s c t s

tionable lipoidal was injected and x ray pictures were made. After the specimens were fixed serial sections were made and studied. All specimens except the first 3 were sectioned longitudinally.

CRUSHING

The importance of crushing was emphasized in experiments Nos. 66, 67, 71, 173, 175. The animal represented oconsutieligations with out primary crush n of the cornua. All rest b lished a patent lumen. The gross appearances revealed constricted areas in which the h at res were buried. Microscopical examinations revealed

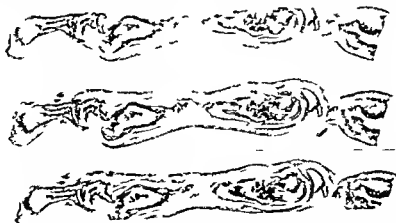
various degrees of replacement of muscle fibers by fibrous tissue in the areas of ligation and int r endometrium and a distinct lumen of d m b l caliber opposite the lature. An example w seen in photomicrograph Figure 1. It w uld appear that the lumen was re-establish ed follo in atrophy of the muscle layers which allowed sufficient relaxation within the lature to permit a return of patency to the lumen. In the remain 14 animal represent n 56 l ations instances of pate cy th ou h the ligatured areas we e fo n l m s do s (Nos. 304, 314, 147, 250, 350) hen crushing precede l l g at on. (See illustrative photomicrograph No. 314R, Fig.) A st dy of these serial sections has led me to believe that the crushing trium m st fficiently involve the muscular membrane to in u adequ te f b r o s across the lumen.

Upon t o o c a s s the rapid application of the forceps to produce crushing was found to tear the wall in ch mann r as to cause a small perforation through which the scleros g agent escaped. This accident was a probable cause of fistula in the orinal technique with resultant f l u r e.

SOLUTIONS

The solution were injected into the lumen of the segment with a No. 4 gauge needle until ballooning occurred. The tension of the solution was maintained for about 20 seconds to prevent regurgitation of the solution through the needle puncture.

Quinine hydrochloride and urethane were used to inject 4 segments (2 dogs) sodium morrhuate was used in 6 segments (3 dogs). Carnoy's solu



F Ph t m r r ph N 34R P t cy p p o t t T t l d e s t r u t
l t h d m tr m w th h b o s s th m t b e t e c th u t u r e s



Fig. 3. Photomicrographs showing the degree of replacement of the endometrium by fibrous tissue. (a) minimal replacement, (b) moderate replacement, (c) extensive replacement.

tion and phenol solutions were used in 14 segments (7 dogs) each. The effectiveness of the solutions was judged by the following microphotographs: (a) the degree of destruction of the endometrium, (b) the degree of replacement by

fibrous tissue, (c) the degree of closure of the entire lumen of the segment.

Carmoy's solution produced the most extensive changes. In all 7 dogs except 1 there was total destruction of the endometrium with complete



Fig. 4. Photomicrographs showing the degree of replacement of the endometrium by fibrous tissue. (a) minimal replacement, (b) moderate replacement, (c) extensive replacement.



Fig. 3. Photomicrograph of a uterine segment showing the lumen and surrounding tissue.

closure of the lumen of the entire segment by fibrous tissue (See illustrative photomicrograph No 314R Fig 3) In the exception No 324 there was complete closure at the ligatured areas but areas of normal endometrium and a partial lumen could be seen. The cornua was greatly enlarged by estrus at the time of operation (Fig 3) Examples of return of patency through the ligatured areas with closure of the lumen between these areas as shown in photomicrograph No 314R (Fig 3)

Phenol solutions were judged a close second. The changes progressed more slowly after injection and there were 4 instances when the lumen was patent through the ligatured area (Nos 304, 47, 250, 350) although closure of the lumen within the segment was obtained in all instances. The 75 per cent solution of phenol was favored (No 14R Fig 4).

Quinine hydrochloride and urethane and sodium morrhuate solutions produced only mild reactions and were considered inadequate

RESULTS

The nature of the uterine changes occurred in the uterine segment following the technique of the experiment. The uterine segment was involved externally by a few minor reactions. In the sections of the uterine segment the uterine lumen was found in the lumen of the segment. Several dogs passed through a period of estrus producing cystic areas or hydrosalpinx in the segments between the sutures or above them (Fig 3).

SUMMARY

The experiment has demonstrated the following:

1. Adequate trauma must involve the mucous membrane layer in order to produce stenosis of the cornua in the dog.
2. The degree of physical trauma was difficult to gauge when induced by crushing.
3. The addition of chemical trauma produced a satisfactory result in all experiments.
4. The sclerosing solution must be adequate. Carnoy's solution and 75 per cent phenol solution were satisfactory.
5. Several causes of failure occurring in the original technique of Madlener were suggested.
6. Absorbable suture does not remain in place a sufficient length of time.
7. Simple ligation without preliminary crushing does not traumatize the mucosa sufficiently.
8. Rapid crushing may cause shearing with resultant fistula formation.
9. Heavy cornual musculature which is present during pregnancy or estrus may lead to complete crushing.

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EDITORIALS

SURGERY

Gynecology and Obstetrics

IRVING H. MARTIN
101 Madison St.
90 1935

LOYAL DAVIS, Editor

Issue 13

SUMMER KOCH MICHAEL I. MASON

DONALD C. HALFORD, 1st Editor

SEPTEMBER 1945

THIOURACIL

THIOURACIL is a drug of positive action in reducing thyroid toxicity but unless carefully administered it is capable of producing disastrous complications and even fatalities. All information obtained by practical experience should therefore be made available at the earliest possible time to those now employing it or likely to employ it. So far its manufacturers have supplied the drug entirely for experimental use. Whether or not it will be put on the market for general use soon I do not know but it seems likely from information at hand that it will not be so available for at least a year.

Dr Elmer C. Bartel, of the department of medicine of the clinic in cooperation with the surgeons in the clinic has administered thiouracil to 100 patients with severe hyperthyroidism who were being prepared for thyroidectomy and we have all watched the results with interest and profit.

Given in proper dose over a sufficient period of time thiouracil has in our hands never

failed to reduce the metabolic rate to normal. We have seen no patients in whom it was impossible to reduce the metabolic rate with thiouracil. Whether or not the remission produced by thiouracil in hyperthyroidism is temporary or permanent only time will tell. This point cannot be settled until we know how many recurrences take place when the drug is withdrawn and how long the patients in whom a remission has been produced remain in remission.

While we wait for this proof we should take advantage of the fact that in a patient very ill with hyperthyroidism thiouracil if administered over a long enough period and in proper dose will bring the metabolic rate to normal. The patient goes to operation in a nontoxic state and recovers from subtotal thyroidectomy with as little postoperative reaction as occurs in patients with nontoxic adenomas. In other words with the proper administration of thiouracil fatalities from operations on toxic patients should be eliminated, postoperative storms should disappear and multiple stage thyroid operations should not be necessary.

We have learned that thiouracil should not be given unless the patient can be seen at least every ten to fourteen days and blood examinations made against the possibility of the onset of agranulocytosis. At least fourteen deaths have been reported in the literature from agranulocytosis after administration of thiouracil.

Letters have been received from surgeons in all parts of the United States who complain bitterly that thiouracil makes the operation of subtotal thyroidectomy difficult because after it is used the gland becomes so friable that it is impossible to control bleeding adequately and

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P ject
DEGO T E L Iso mma ty t th Rh F t s
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SURGICAL TECHNIQUE

War Surg ry
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MARWEL T B Fun t al Am h W
B A CH H E B l l t F t es f th Lo B es
L E L B S A t H t Fail F l l ing
Bl t I j ry
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WALKE J M d HAM O J W Th T t
m t f A t i n m y s i th P n l l

PHYSICO-CHEMICAL METHODS IN SURGERY

R t g I G Y
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c i o m f th Ch k A e o l P o c e s F l o o
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Scl s i

HELEN G S Recurrence Irradi ted Carc ma
f th U t r i n C r v i x
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LEA T J and W R c r t H B Acut Obstru
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F S MAN G Roent D gnosi d Irradi
T m n t f Gast S com E s p e c i a l y
L y m p h o s a c m a s d R t i c u l m C l l S o m a
M S KALLIO S C a c i m f th L a r y n x and
H y p o p h y r i n x R o c t m T e a t m t d th
Results f Th py
EKER R d P o r E P r i m r y B S m

Miscellaneous
CHV TUS J J Rad t n I n j r i e s f th I t u
d U n r y B l d d C e d b y Rad m T t
m t f C a c i m f th U t r i n C r v i x
COOKE A G S d R a r s o D F Th Tre t
m t f P o s t r a d i a t i o n U l r s b y Rad
O u t m t

MISCELLANEOUS

CHRISTAL E t h — G e a l P h y l g i c a l C o d i n
S I T O A L H W E K E J J R R m o a n J E
d L e W E Th I f f Local Tre t
m t f B r n s L F u
G n a l B t n a l Prot and Par t l n l
F E R A M Th Th p e t u V a l f P m o i l
Appl d Locally Based Expe en with th
Crud M t n l A n t y f I f t u
Du tie Gland
G ERKA K I Chr n s Thyr d i t i d P m r i
Thyr t m o s i (E p h t h a l m i G o t)
BARTLS E C U f Th u r a c i n t h P e o p l e t u
P p r a t i f P u t s w t h s H y p e
thyr d i m
Surgical P h l g y a d Diag
W ER A S t h o E P a r s E P h l l P
A d O t h A S t p C c C o t l

ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

EYE

Sci H I A. and Reag n D J. Nalig ant E. ph
th lm s t. *Orl Ak l* 945 54 37

The authors discuss general considerations of the orbit to relation of the orbit and periorbital region in primary and in postoperative orbital disease.

Classification of the orbital disease according to the thyroid gland and the thyroid gland disease. The authors discuss the thyroid gland disease and the thyroid gland disease.

In the thyroid gland disease, there is a general edema and lymphocytic infiltration of the orbital content. The authors discuss the thyroid gland disease and the thyroid gland disease.

Loss of vision in malignant exophthalmos usually follows the thyroid gland disease. The authors discuss the thyroid gland disease and the thyroid gland disease.

The thyroid gland disease is a disease of the thyroid gland. The authors discuss the thyroid gland disease and the thyroid gland disease.

Class		Ophthalmo	
Type	Ref	Ref	Ref
1. Hyperbolic	1. M	1. M	1. M
2. Hyperbolic	2. M	2. M	2. M
3. Hyperbolic	3. M	3. M	3. M
4. Hyperbolic	4. M	4. M	4. M
5. Hyperbolic	5. M	5. M	5. M
6. Hyperbolic	6. M	6. M	6. M
7. Hyperbolic	7. M	7. M	7. M
8. Hyperbolic	8. M	8. M	8. M
9. Hyperbolic	9. M	9. M	9. M
10. Hyperbolic	10. M	10. M	10. M

Some cases of orbital disease are treated by thyroidectomy. The authors discuss the thyroid gland disease and the thyroid gland disease.

In 1936, the authors discussed the thyroid gland disease. The authors discuss the thyroid gland disease and the thyroid gland disease.

Thus procedure is not only less disfiguring than the Naff procedure but it utilizes an actual rather than a potential space. Moreover, in some cases the roof of the orbit is occupied by an extension of the cell which the Naff procedure avoids and subject to the objective position (which may follow the intracranial operation) does not occur in the procedure.

Crawford R A D. R. P. of Perforating Corneal Wound. *La c l Lo d* 1945 48 366

A series of 33 cases in which repair of perforating corneal wounds was accomplished by corneal sutures compared to a group in which conjunctival flaps were used. No minor perforations were included and all cases studied were without a retained foreign body.

Those cases in which a traumatic cataract developed showed less satisfactory results. Sulfathiazole was used but no penicillin. The comparative study with the procedure showed little difference in the end results.

The important factors in the technique of the sutures associated with the placement of the sutures as well as the more prolonged restoration of the anterior chamber and the elimination of infection.

Cross L D. Ocular Effect of Altitude Flight and of Deep Sea Diving. *Ophth Ch* 945 33

Changes in atmospheric pressure in flying are within the range between the pressure at sea level (atmosphere) and that at the maximum altitudes attainable by military aircraft (1/6 atmosphere). Pressure is counted in terms of pressure in atmospheres. The authors discuss the atmospheric pressure and the atmospheric pressure.

The ocular effects of changes in atmospheric pressure may occur as part of a general anoxic syndrome. The authors discuss the atmospheric pressure and the atmospheric pressure.

Symptoms of anoxia which may persist from the first six hours vary with the altitude and the duration of flight. These include peripheral numbness, right homonymous hemianopsia, salivary gland dysfunction, spots before the eyes, dilatation of the pupils, yellowing of the sclera, and cataracts.

SURGERY OF THE NERVOUS SYSTEM

PERIPHERAL NERVES

Ehnl G and W Itman II W II mlf clal Spo m
A k A P j k t Ch c 945 53 5

On the basis of 16 cases of hemifacial spasm
curr g among 663 cases of pathological movements
of the face of all sorts the following conclusions are
drawn

1 Women are more frequently afflicted than men the
ratio being about 6 to 4

2 Children do not have hemifacial spasm

3 In cephalic lesions or articular diseases without hyperreflexia seldom bears a causal relation
ship to hemifacial spasm

4 The spasms usually begin in the orbicularis
oculi muscle and discontinue gradually adjacent muscles
until in certain cases the entire facial musculature
is involved

5 Spontaneous remissions in periods prior to the
years have been noted

6 The spasms almost always cease voluntarily by circumstances causing nervous fatigue
or voluntary movements of the face

7 No patient was able to stop the spasm by a
effort of the will

8 Only 5 patients were successfully cured without
resort to surgical treatment although these may still
be prone to relapse

9 Spontaneous facial paralysis was premonitory
in 3 cases which later factually results

10 Argument is given for the view that the lesions
causing the condition is in the facial nucleus
of the brain

BRAIN AND ITS COVERINGS CRANIAL NERVES

Il enby W B Gr Intra b I l m t m s
V I A S t I J M 945 45 8 0

The present study of the point of origin of
the motor branch of the trigeminal nerve
is reported in the following: Fourteen of the patients
who died of the disease died of a post-operative
pneumonia and the remainder died of a recurrent
hemorrhage from a ruptured aneurysm of the
anterior cerebral artery

Seven of the cases were associated with cerebral
arterial disease (arteriosclerosis and/or hypertension)
and the remaining seven with tubercular
encephalitis (3 in the basal ganglia and 4 in the
cortex). One case was proved to be a case of
epilepsy. In the remaining 7 cases the point of
origin of the motor branch of the trigeminal nerve
was found to be in the lateral part of the
motor cortex of the frontal lobe

The following cases were found to be of the
gradual type: 1. In the case of the patient with
gradual onset of the disease the point of origin of the
motor branch of the trigeminal nerve was found to be in the
lateral part of the motor cortex of the frontal lobe

development of signs of increased intracranial pressure
after an acute onset of symptoms

The cases of intracerebral hematoma arising
from an artery are most common near the rostral
part of the circle of Willis in the frontal lobes. They
usually manifest themselves by a subarachnoid
hemorrhage the acute symptoms of which may
clearly show the development of an expanding
cystic lesion and operation for its removal is
indicated. In the case of the hematoma the wall of
the hemorrhage usually shaggy and stained with blood
pigment. The aneurysm is usually not seen

The cases associated with tumor may be followed
by a gradually increasing movement even though the tumor
itself is not removable

The lesion as located in the frontal lobe in 4
cases the temporal lobe in 5 the occipital lobe in 3
the cerebellum in the parietal lobe in 1 and in the
ventricle in 1. Most other writers have reported
the lesions as being found predominantly in the
temporal parietal region. However there are
many reports that although other areas both in the
brain and spinal cord are involved

The age of the patients in this series ranged from
thirteen to seventy-three years the average being
forty-one and eight of the thirty-one. Some writers have
been impressed by the youth of the patients but
for none of these reasons

The author was unable to reach any conclusion as
to the type of clot to be found in any particular
artery. The lesions of the blood can be obtained from
almost all of them and when they are opened it
is almost certain that at any time after the
hemorrhage the aspirated blood is empty. In the
case of these lesions if the patient gets worse the lesion
of the lateral caudate or opened directly. Finding
out the causality with colloidal thorium diodes
penetration is all possible a later roentgenographic
check upon the progress of the lesions

Because of the formation of scar tissue in the wall
of the cysts epilepsy has developed both in peroperative
cases and in those surviving without operation

HEAVY A. SHELL M.D.

Dieters W W Characteristic Roentgenographic
Changes A. occluded with Tuberos Scleriosis
A. k. A. P. j. k. t. Ch. c. 945 53 99

Two typical cases of tuberous sclerosis were com-
pletely examined to determine the location of the
characteristic areas of calcification seen in the
roentgenograms. Both patients were idiots with long
histories of convulsive seizures with a bac-
terial meningitis and its spots and the characteristic
areas of calcification in the skull. Autopsies were per-
formed and in each the usual findings of tuberous
sclerosis were seen in many small white nodules
of different sizes on the surface of the brain with sim-
ilar nodules in the cerebellum and in the

Il t l l a i at f t l f t h s l l
 t g l s
 R t g g t l f t h f
 f t h l t h t r l t l t as
 sho t t t h r o x g e l c a l p l t s t
 i t d the skull r a y a m a t of t h t d
 b r a n a l e d n t h n i t h a t h a s f
 c e e d n s t y n t h e s k u l l w h e m n e d h t
 l g c a l l y h o w d h y p r s t o s f t h n e t a b l a n d
 f t h t b e c u l e f t h d p l o c p e e s T h c a l
 r u m a l s f u d t b f d m n h d t h c k e s
 M a y f t h e s l a d s o f h y p t s s i t h e k u l l
 l a y t b r u n o d u l e i n t h b l c o t
 A D R I V E R M D

Il f t t L S m l k E A d B u l K P
 f n t l L o b o t m y n T t m n t f C h n e
 P y c h w i t h S p e i l R f n e t o S c t i n f
 t O b i t l A r e s O n l y A h A P h a t
 C h u 945 53 f

Th a t h o r d e d d t l u m i t h p a t n f p r
 f r n t a l b t m y t o s c t n f t h r b i t l g o n n l y
 o r o f t h l w e r q d a n t s i f f t a l l b e T h
 s d n e w t h t h e b p e t h a t i t w u l d p t b e
 f i e t i e t e m e n t a d a l r e s t i c t e t h a t t o f d
 t r u e t o n a d p t o p a t e q u l A b r r h l e
 a s p l e d 5 c m a b o e t h e y m a t e r h d 3 c m
 p t o t o t h e l a t e l r m f t h b t T h e t p l
 t h e t r c l w a s l a t e d a d a c u t m d e n t h
 c r o n a l p l e t t h e d e p t h o f 5 c m i n f n t o f t h t p
 f t h e e n t c l f o m t h e l e v l f t h e h u r h l e d o
 a d T h i s p r o c d r e w c a d o t h a t r l l y

T w n t y t w o p a t e t s b o p e s l y b d b e
 j u d g e d s b a i g e r y p o o r p n o s w e s u b j e
 t t e d t o t h i s m o d i f i c p r o c e d u r A l l h a v e b e n
 f l o w e d u p f o r a p r o d o f t e l m t h s o f
 f t e p e a t o T h e o d i n s c s e d e d
 m u c h i m p r v d h n t h e p t n t o l d e u m e h s
 o c l t y t e a d t m t o b s f m l e v l f
 c c u p a t i n I t w a s c a u d e d a s i m p d w h e n
 t h e p a t i t a s a b l e t o m a k e b e t t e r t t u t n l
 d s t m n t d l i g h t l y i m p o e d h n h e b
 c a m a l e s t r a b l s m e n r u n o r u d a l p b l m

T h r e p a t i s s t e n g l m f i e t e c t n
 t y p e s o f p y b s a d w h p r u l y b d h d a
 a f m e t r a z o l r l e t r e s c k t a t t e m t

e o p e r a t e d p T o f t h e b t h t a t d d e
 p r e d s d i d l s w e g r t l y b e n t d T h
 t h d p t e t w h a d b a n a c h o m s t t
 w s b e e f i t e d u f f c n t l y b e t u r n d h r f m l y
 O n p a t i t h o b s e s s o m p u l n e s
 w h o h d p v l y n o t e p o d d t 7 m e t l s
 e l t r a c s h o c k t r e m n t s g t l y b f t d

T w o n u r a s t h e p t n t b o t h f w h o m h a d
 b e e t r e a t e d u c s f u l l y w t h u l n a d m t l
 e l c t r i c s h c k p r p e t e l y e r r t l y b e
 f i t e d b y t h e o p r a t n

O f 4 p a t n t w t h e p i l e p y d p y c h o a l l o f
 w h m e o p e r a t e d p o w a s g a t l y b e f i t d
 a d 3 w e o l y s l g h t l y b n f i t e d b y t h p e d e
 l t h e s b i z p h n e g r p t h e c o d i t n w s
 m c h i m p r o d 7 c a e s s m e w t h t m p e d

a l l h i l y p e l t f d i o
 M l l l c p t t h l t l l t r a t f
 h l t h p l g t h d t h h h
 t t f e p t p a t i
 N l t l i f c t s p l e t c s e u f
 l l f m t h e p r o c d u t o d t T r a t r y n
 t c d e l p d i 4 f t h e a p t n t s h o m
 n l y t h f e r q a d t s w s e c t i n d a s o p p o s e d
 t 4 i 8 p a t i n s n h o m i l 4 q u d r a t s w e e c
 t d T w o p a t t s h d m l d t r a n s t r y h m
 p a s a n d n t h e r s t h e r e s m a k d n t e
 f c e w t h p e h b u t t h a b o a t r a s t r y
 P s t p r i c c n f u n a n i d s r t a t i n r n
 l q e c t l y b e r v d d h a d n e f f e t o t h t
 c m M e t e a l e p n s n t h f i r s t
 p s t p t e l y l d o t a f f e t t h u c c e s s f u l o u t
 c m e o f t h e p a t i n I m p r i m t o c c u r r e d
 t h r a f e c k s o f t e a s l o s y e r
 I s m m r y a p o t p e t r e v r y a t e o f 4
 p r e c t a b t a d a r u l t c o m p r f a v r a b l
 i t h t h a r a t e o f c o e r y f 3 p e r t t
 17 t h r c i n c e s T h e i e d e e f i r a t r y p o t
 p e r a t v e u r y c t n e n e w s m e h l a d
 p s t o p a t i e d l l g n d l w g u p e l s p
 o u c e f w t h t h m o d i f d p r a t I t o
 c l d d t h t s a t f e t r y t h e p t e e s l t p a
 t n t s t h e m t a l d s d e r s s b t i l t h e c
 t n o f t h e b t a l u f s l n d t h a t t h o b t a l
 a a f t h e f r t l l b s h l e g u l t
 o f t h e m t i H e w A S u r g M D

C o h n R E l t o e c e p h a l o g r a p h i S t u d y f P r e
 f n t l L o b o t m y A S t d y f F o c a l B r a i l
 f r y t A h P j A f C h 945 53 f

C h n e r e d t l t c p h a l g p h e s t d
 o n p a t e t b e l d f t e p f o n t l l o b i t m y
 r d t d t m t h e d e n e f e b l d m a g
 d h o w t h i s d c m y h l p t i t p e t l e c t
 c p h a l g r a m i n f c e d e t l t u m

T h i m m d t b o m l l t e c p h l o g p h c
 e s p o n s e t o p r f o t a l l b t o m f c a l f i l l
 n e n f m t y w t h t a t m l o l l s u b
 j e c t s f m h o m e r c d g s e t k n w t h
 d y s f t r p e a t o n h g h o l t g s l w e s w
 b e r v d n t h s y m m t c a l f o n t l l d s W t h i n
 n t o t h e e m t h i s f t o p e r a t t h p r o m t
 l w f q e c y e s f t 4 p o n d y w e r e t r e
 p l e d b y s h r t s q u e s f 6 p e e c o d w e s f
 d u c d a m p l t d I n m o t b j t s t h l o w i n
 t n s t y b o m a l t y p r s i s t d a a b d m n a t
 b r c t e s t c a s l g s c d g s e r m d e

I 3 s u b j e c t s h m t h r l t c o d g s w
 m d t h n e m o t h f t p e a t o b n o r m l
 e f r m s w e r c o g d l d e d l o b o t m y n
 d d t h r p l a m e n t f p p e t l u g h f
 q n e y a e s b r m l a p p e g l p h a e s
 R r s o n t t h p e r a t t r l d o c
 c u r r d m t h l t

H y p e r v t a t g r t l y c c t u t d t h l w
 f q c y c h t e t e s f t h e l c t o e c e p h l
 g r a m f l b t m d d d u a l s b h p p e r a
 t l y c n n f c d b y m l a p c d

It is evident from this work that old cerebral lesions give rise to focal and general electroencephalographic changes and therefore the presence of prominent electroencephalographic abnormalities with old hemiparesis must be considered as being causally related to the cerebral damage.

On the other hand the study also shows that in the presence of known cerebral damage (acute or chronic) electroencephalographic abnormalities may be minimal or absent.

The effects of hyperventilation on the electroencephalogram after injury (lobotomy) demonstrates that a normal disturbance is an important factor in the production of slow waves during the process of deep breathing. This clinical finding makes it necessary to partially de-emphasize the role of alteration in the blood sugar in the production of slow waves during hyperventilation.

HENRY A. SHERRIN, M.D.

Meyer A. It. Meningococcal Meningitis. Report on 165 Cases. *J. Int. Med.* 1945; 2: 543.

The cases of cases of meningococcal meningitis were observed in the period from July 1942 through May 1944. One hundred and fifty cases were followed by direct smear or culture. The additional 15 cases were included because of the presence of a purulent spinal fluid and their occurrence in an epidemic period. The overall mortality rate was 3 percent for the period of 15 cases it was 4 percent.

Six of the 9 deaths occurred within the first two to four hours of hospitalization. On the other hand the results of the delayed diagnosis and the death occurred after adequate treatment.

The therapy consisted of 15 gm of sodium sulfadiazine given intravenously in a liter of physiologic saline solution followed by 5 gm given orally every 4 hours. A stomach tube was utilized for medication and the gastric fluid during coma. A fluid intake of at least 3 liters daily was maintained. Children received an initial dose of sulfadiazine of 15 gm/kgm per enterally followed by oral doses calculated as follows: 15 gm per kgm. The blood chloride was maintained at 0.9 gm per 100 cc. The sulfadiazine was usually discontinued on the fourth day of treatment. The clinical drug actions were not noticeable in the case of children.

Meningococcal meningitis was used in cases of fulminating meningitis. The treatment consisted of 15 gm of sulfadiazine given intravenously in a liter of physiologic saline solution followed by 5 gm given orally every 4 hours. A stomach tube was utilized for medication and the gastric fluid during coma. A fluid intake of at least 3 liters daily was maintained. Children received an initial dose of sulfadiazine of 15 gm/kgm per enterally followed by oral doses calculated as follows: 15 gm per kgm. The blood chloride was maintained at 0.9 gm per 100 cc. The sulfadiazine was usually discontinued on the fourth day of treatment. The clinical drug actions were not noticeable in the case of children.

Repeated lumbar punctures were made to increase intracranial pressure and to facilitate laboratory investigation and to intrathecal administration of antibiotics. The sequence of treatment was as follows:

1. After diagnosis of a three-year-old child with subsequent meningitis (1) laceration of a meningeal membrane in a patient with an overwhelming infection on admission who recovered (3) quadriplegia and respiratory paralysis successfully treated by means of a respirator and lumbar puncture (4) ptosis of one eyelid and unilateral optic atrophy (5) a purulent effusion into the knee joint and a purulent pleural effusion all ended gain recovery without drainage (6) in the cases of questionable hydrocephalus in infants and (7) a hemiplegia in a fifty-nine-year-old hypertensive patient.

HENRY A. SHERRIN, M.D.

SYMPATHETIC NERVES

Stillman J. J. and Fowler E. A. A Simple Technique for Outlining the Sweat Pattern. *J. Med. Ch. C.* 1945; 7: 8.

A new technique for outlining sweat patterns is briefly described. The authors had previously described



Fig. 1. A simple pattern for the palm, demonstrating the technique of applying a grid and recording the results. B. Diagram of the individual's hand showing the results of the recording with the same technique. C. A photograph of the palm treated by the application of the acid.

It l c l a at f th i t l l l
 Rn g n g t l f th i
 f t l a n i t h b r a l i a c h t a
 ho that t l r o n t h l c a l p l t
 in t d th skull \ a x m a t o i f t h t d
 b a e c e d t h n e t h e c a f h a e a s f
 n e a r s d e n s t i t h s k l l w h e x m i n e d h
 l o g c a l l y h d h y p e t f t h e r t a b l and
 f t h e t r a b e c u l a e f t h e d p l o s p a c e s T h e c a l
 v a r i u m a a l s f u d t b e o f d m n h d t h c k n e s
 M a n y f t h u s l n d s o f h p e r o t i n t h e l l o e
 l a v t b r u s n d u l t h e c b l o t
 A n \ M D

II f s t a t t L S m l k E A n d B c h k P r
 f o n t l L o b o t o m y i n T r e t m n t o f C h l
 P s y h o s w t h S p e c I R f e n t S e c t i n f
 t h O r b i t l A r e a O n l y A h \ P s y h a t
 C h 94 53

T h u t h r s d c e d e t l n t t h p r a t n o p
 f o t a l l o b o t o m y t s e c t i o n f t h b l e g o n n y
 o f t h e l e q u d a n t s o f t h e f r a t f i b e T h i s
 a d o n u t h t h o p t h t t o u l d p r t b e
 f l e c t v t a t m e n t a l l o c t r i c t h t t f d e
 t r u c t u n n d p t p r a t s q e l a A b u r h l
 s p l a c e d 5 c m b t h e v g o m a t i a c h d 3 c m
 p s t e r t o t h e l a t r l m f t h o r b i t T h t o p
 o f t h e v n t i c l w a s l c a t d a n d a u t m a d e n t h
 r o n a l p l a e t o t h d p t h f 5 c m i n f e n t f t h t i p
 f t h e v e i c l e f r m t h e l l f t h e b u r h o l e d n
 d T h p e d u w a c a r e d o u t b i l a t e r a l l y
 T w t y t w o p a t n t s b o p r v o u s l y h a d b n
 l d g d a s h a v i n g a r y p o o r p o n o s r e u b
 l t e d t t h i s m o d i f i e d p r o d u e A l f h a e b e n
 f l l e d p f r a p n o d f t a l m o t h f g r
 a f t r o p a t n T h d i t o a o s d r d
 m u c h m p d w h e n t h e p t e t c u l d e s m h s
 c l a t t u s a n d r t r n t h s f o r m f v e l f
 o c u p t o n I t a c o n s d r d a s m p d w h e n
 t h p t n t w a s b l e t m k a b t t s t u t u l a l
 a d j u t m t a d s l i g h t l y m p r e d w h e n h b
 c m a l e s t r u b l e s m e u r s n r e u s t d l p b l e m
 T h e p t n t s u f f e r i n f m a f f e t r e a t n
 t p s o f p y c h o s s a n d w h p r o s l y h a d h a d a
 e r a g e o f 12 m e t r a z l o e l c t r c s h o c k t r t m e n t s
 r o p e a t e d p o n T w o f t h e s b t h g t a t e d d
 p e s e d u r d i d u l s w r e g r e a t l y b n e n t e d T h
 t h r d p a t i e n t w h h a d b n u r a c h t o n m a n s t t
 w a s b e n e f i t e d u f f i c a t t y t o b t u r n d t o h f m l v

O p e a t n t w t h a b s e c e m p l i v e e u o s i s
 w h o b d p e v i l y n o t r p d e d t 7 m e t a l o r
 l t r i s h c k r t r m n t a a s e a s l y b e f i t d
 T o n u r a s t h e c p a t i n t s b t h f w h o m h a d
 b e n t e a t e d u n u c c s f u l l y t h l n d m t r z l
 r l e c t t o s h c k p r e o p a t l y w r e g e t i v b
 f i t d b y t h o p a t n
 O f 4 p a t n t s w t h e p i l p s y a n d p s y c h o a l l f
 w h o m w e r e p e r a t e d p o r a g r e a t l y b f i t d
 n d 3 w o n l y s l i g h t l y b n e f i t e d b y t h p d e
 I n t h s c h i z p h g r u p t h c n d t n w a s
 m u c h m p r d 7 s e s m e w h a t m p e d

4 a l s l h t l y i m p r l t i l v o
 H l l r p u t t s h l t h l t a t f
 h l t h j a a l g r p h l t h b h
 t r t f r e j n s t p e a t
 N l a t h i f e t n s r p l p t c s e u h e
 u l t f l t h p r o c d u e t o d t T a n i t r y
 t e c d v f p l a 4 o f t h 2 p a t t s h m
 o l y t h e l o r a d r a n t s r s c t i o n e l a s o p p o d
 t 4 f 8 p t e t s i w h o m l l a q a d r t s e e s e
 t e d l p a t n t s h a d m l d t r a n s t r y h m
 i r s d m o t h e r s t h e w s m a k e d t
 f c t h s p c h b u t t h a l s a s t a t o r y
 I s t p a t e c o n f o a n d d s r n t a t o w e n
 f e t e t l y o b v e r e d n d h a d n e f f e c t o n t
 c m A c t e s a d e p n i e n s o n t h e f r s t
 p t p r a t e d a y d d n o t a f f t h v e r s i l u t
 c m o f t h e p e a t n I m p o e m e t o c c u r r e d
 w t h n a f v e l s o r a l t e s l o n a s a y r
 I n s m m r y a p t p a t i e c o r y r a t l 4
 p e r c e n t w a b t a d a r e s l t e m p a g f i a b l
 i t h t h e r a g e r a t e o f r e c o v e r y o f 3 t 3 p e c t o f
 7 o t h r c l i n i c s T h i n c i d e n t o f t r a n s t r y p t
 p a t i e u n a r y c o t n c e a m u c h l
 p o t p a t e d i l l g d l o w g u p e l p r o
 n o c d w t h t h s m d f i e d p e a t l t a c
 l u d d t h t a s a t s f a t o r y t h r a p e u t e r l t i n p a
 t e n t s w t h m e n t l d r d e r a b t e d t h c
 t o t o t h b a l s u r f e a l o n d n a t h a t b l l
 a e s o f t h e f t a l l b e s h a a r o l n r g l u
 o f t h e m t i o n H w A S E M M D

C o h n R E l e c t o e n p h l g r a p h i c S t d v f f r
 f r o n t a l L o b o t o m y A S t u d y o f F o c a l D r l
 I r y A h \ P s y h a t C h u 94 53 53

C h c a r e d o t l t e n c y h a l g r a p h i c t d u s
 n p t t a b l r d f t r p e o f l l b o t n r
 r d t d t m n t h l e f e c b r l d a m a g
 a n d h w t h i s d n m y h l p t o t r p r t l c o
 e n c e p h l g r m s n e a s i a c d n t a l t m a

T h i m m d a t e b o m a l l t e n p h a l o g r a p h
 e s p o n s t o p e i o t a l f b t m v f a l f o n t l
 n c o n f r m t y w t h t a a t o m c l o n i n a l l b
 j c t s f e m h m e c o d g s t a k e n w t h a d
 d y s f t e p e r t n h g h o l t g s l w w a e s t
 o b s r d d u t h y m m t e a l r n t a l a d W t h
 e t o t h e m o t h a f t e p e r t n t h p o m i n t
 f f e q e n c y e s (t o 4 p e r s c d) w e r e
 p l e d b y h r t q u n s i f 6 p e s e o n d w a v e s o f
 r e d c d a m p l i t u d I n m t s b j t s t h l w n
 t n s t y b n o r m a l i t y p e r s i s t e d a s u b d o n a n t
 c h r a t e t i c l g a c o r d s r e m a d e

I n 3 s b y e i s m a w m t h e r l t c o r d i n g s w r e
 m a d w t h n o n e m t h f t e p e r t o n b m a l
 w f r e s w e r e r e g n e z e d I n d l o b o t o m y i n
 d c d t h e r p l a c m n t f p e p e t c h g h f
 q n e v w a s b y n o r m l a p p e a r i g l p h a e s
 R e s o n t o t h e p o p e a t e c t r l r c d o c
 c u r d n m t h l a t e

H p e r v e l a t g t l y e c c t a t e d t h l o w
 f q c y c h r a c t e s o f t h e e l e c t r o c e p h a l
 g r a m f l o b o t o m d n d v d u a l w h p e o v e r
 t e l y e e n i l c d b y a s i m l a p r e d

It is evident from this work that old cerebral lesions give rise to focal and general electroencephalographic changes and therefore the presence of prominent electroencephalographic abnormalities with old head injuries must be considered as being closely related to the cerebral damage.

On the other hand this study also shows that even in the presence of known cerebral damage (acute or chronic) electroencephalographic abnormalities may be minimal or absent.

The effects of hyperventilation on the electroencephalogram after injury (lobotomy) demonstrate that a normal disturbance is an important factor in the production of slow waves during the process of deep breathing. This clinical finding makes it necessary to partially de-emphasize the role of alteration in the blood sugar in the production of slow waves during hyperventilation.

HENRY A. MENINGOCEPHALITIS

Meyer A. H. Meningocephalitis. *Archives of Neurology and Psychiatry* 1945; 54: 343.

This series of cases of meningocephalitis was observed in the period from July 1943 through May 1944. One hundred and fifty cases were proved by direct smears, culture. The additional 5 cases were included because of the presence of a purulent pleural fluid and their occurrence in an epidemic. The overall mortality rate was 53 per cent for the proved 50 cases it was 4 per cent.

Seventy of the deaths occurred in the first twenty-four hours of hospitalization. One death resulted from a delayed diagnosis and only 2 deaths occurred after adequate treatment.

The therapy consisted of 5 gm of sodium sulfadiazine given orally in a liter of physiological saline solution followed by 1 gm given orally every 4 hours. A stomach tube was utilized for medication and the giving of fluids during coma. A fluid intake of at least 3 liters daily was maintained. Children were given a total of 150 gm of sodium sulfadiazine per kilogram parenterally followed by 100 gm of sodium sulfadiazine per kilogram. The sulfadiazine was usually discontinued on the fifth day of treatment. The only drug acts were given in cases of meningitis.

Meningococcus antitoxin was used in cases failing to respond to sulfadiazine without entirely satisfactory evidence of an overwhelming infection. Antitoxin administered in 30 to 36 per cent of all cases. In patients with signs of a generalized convulsion, 0.5 gm of sodium valproate was given 3 to 4 times daily. In 3 to 4 years old the average dose was 0.5 gm. The antitoxin was given in a single dose of 100 units and half an hour later.

Repeated lumbar punctures were made to relieve the intracranial pressure and to maintain a respiratory alkalosis and/or intracranial hypotension. The sequelae were (1) irritable

week after discharge in a three-year-old child after subsequent recovery. (2) ulceration of a massive purpura in a patient with an overwhelming infection on admission who recovered. (3) quadriplegia and respiratory paralysis successfully treated by means of a respirator and lumbar puncture. (4) ptosis of one eyelid and unilateral optic atrophy. (5) aseptic purulent effusion into knee joints and a purulent pleural effusion all ending in recovery without drainage. (6) instances of questionable hydrocephalus in infants and (7) a hemiplegia in a fifteen-year-old hypertensive patient.

HENRY A. MENINGOCEPHALITIS

SYMPATHETIC NERVES

Silberman J. J. and Powell V. E. A Simple Technique for Outlining the Sweat Pattern. *British Medical Journal* 1945; 7: 178.

A new technique for outlining sweat patterns is briefly described. The authors had previously de-

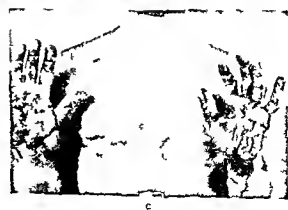


Fig. 1. Schematic diagram of the procedure for outlining sweat patterns. The technique involves applying a grid of dots to the skin and then tracing the dots to form a pattern. The dots are arranged in a regular grid, and the pattern is traced by applying a liquid to the skin.

combined a method for showing the sweat pattern in the hand and the new method is an adaptation of this one which is suitable for use over the rest of the body. The only chemical used are alcohol, tannic acid and ferric chloride. The ferric chloride is diluted with three parts of alcohol and applied to the skin through a cotton-tipped applicator. This evaporates rapidly, a dilates a dry urticarial wheal. With ferric chloride an tomato red then is developed. The tannic acid produces the area. As the sweat glands function the red sweat in the skin diffusely blackened. *APRIL 1937 G. H. M. D.*

MISCELLANEOUS

Lewy F. H. What is the Guillain Barre Syndrome? *J. Pediatr. Surg.* 1935 6 65

The author points out the confusion which exists in the classification of certain polyneuritis polyuropathies and syndromes of peripheral neuropathies. The recent tendency has been to include all of the conditions under the so-called Guillain Barre syndrome.

Two case histories representative of the Guillain Barre syndrome are described as follows: the first pathological findings. Autopsy was done on a child who died unexpectedly in the fourth week of the disease from a acute degeneration of the peripheral nerves.

A comparison of the sacral nerve roots in these two cases was made possible by peratoposure of

the sacral roots: the second case which represents an adherent nerve roots from which sections were removed.

Pathologically, peracute radiculopathy of almost necrotic nature was found. The myelin was partially dissolved in many instances was found to be completely dissolved while the axons cylinders were fragmented.

Further extension of the demonstration of the child at autopsy as the phrenic nerves showed signs of acute irritation evidenced by cerebral anhydrosis, cutaneous derangement, necrosis in the anterior horns and degeneration in the white matter of the spinal cord. All of the conditions had failed to produce clinical signs.

The oligoalbuminemia of the Guillain Barre syndrome was described as a but a fully recognized polyneuropathy with peripheral neuropathic changes in the motor nerves and albumin cytological detection on the spinal fluid.

It was pointed out by the author that in 1937 Guillain himself described this syndrome without a year's delay at the same time.

The suggestion is made that the designation Guillain Barre syndrome be retained as general designation for the various forms of polyneuritis and radiculopathy known without exception at the present time to the central nervous system and a partial block as indicated by the albuminocytological dissociation of the spinal fluid.

H. A. B. OWEN M.D.



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①

Fg Ill t t d p t g th mod fcat f w dg f breast tuss sc d d th q ed
the tag m t pevy f Th hes f ci h m
thee refully m as d m ked t ndr t h n w
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f d d th suz f th k f p B Th km s und
ed th k f p The ppl a d t req d m t
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esected th espe t th lat A la b t t
of kna c ed t t th npl t C Th

dge of th ucl n n j ca r d p r p d br t m d f m th ppe p le The k
ula f a d t w th n h lf n h f th u n ppl v t b a t nd r m zed th k f p t
t P m th lo r nt r f d t n c n j t b lo th l l Th pp pol f th
ca ried pend larly d f d t th fr hr t fi d w th t e l k tu to th pect al
mammary lin A other n bout o m l f s th e d r b a r e cular r a f i
carr d d th nf m mmary t f m m ed f the new ppl d last d the
a n t l T O e t m r g l a d e s f ppl a d a l a c a f l y to plac t

cess of *kia fr m th apr n il p* remov d and the edges ar sutu el \ Penrose d ain i nse ted high nto ither corner of the wound T o weeks later th previous line f inci on long the inf rammmary line is opened and f om its center dge n incus n i made p a d t th cent r edge of the are l to form an in ert d T T o thick t angular flaps are cr ated to expose th medial and lat ral poles of the brea t T o three triangula v dges f b east are remo ed a d f necessary a sem cicular section is mo d along the inf ramm r y reg n Th r q red mount of kin is rem ved b th from th c nt r f ach flap a d f om its n fer o port n A Pen se drain is placed in ach angle f the wound I LO LATIMER M D

TRACHEA LUNGS AND PLEURA

II yw rd J l The R m val of Blood fr m Teau m ti Hem th races A l l y 2 l nd J S g 945 a 57

The a thor d cusse the m nag m nt of ca es of traumatic hemothorax in the Ne Guin a battl fr t Th is st ll some contro ersy as to wh th r or not teni hemothor cess sho ld be aspirated The a th r b le es that the a guments against asp a t such as the int d cti n of infection th e st tng f fresh h mo bage nd the splati ge ff ct f the blood on the lace ated lu g have been a refut d Bl od m y clot n the pl ural cavity m o s ways a d d ffe nt d gres varyng from ho t th ad f sub int a larg coagul m f fibrin The fl d c nents of diff re t locul may va y i col r and c nstency The clottng vari s from c se t case nd it is bvis a that a number of f ctors at play The a thor h l es that the facto f infect on is a important one

Blood may b rem ved f om the pleu al cavity by various m thod ch as aspiration i te costal tube dra nag and by rib sectio i te closed lrai ag The ca es in New Gu ne e treated by repe ted aspirat n with a replacement A rule n t more th n pit f blood was remo d t a time and the p c w r peat d i thre d vs A thes ca es w tr ted up to rd the f nt t as ften neces ary t subject th m t a pr at on n th way t th base hospital

FORREST D DO KILL, M D

Th m C P nd Clcl nd W P Dec rticnti n In Cl tted d Infectd II m th ra s La t Lo d 943 48 3 7

II m th by f th comm est c mpla t i che t j ries f r t m v be ass c ted th ny f th r s types of injury pr d c d by bla t ru h g nald t nt pe etrat g and p f rat ing w l

O e mu t dff tit t b t een a m pl h mo th ra wh ch them the most import t f t f aa ny ry d th c mpo nd o c m pl c t d h m thorax i wh h th pl ral blood s coated th a m e i us mpo t t jury t sh lu g

daphragm or chest wall Alm t ll f th latt r type of cases require acti e su gical tre tment Th associated hemoth rax if remo ed at the t m of operation rarely causes further serious touble The mple hemothorax presents rather a differ nt problem for with adequate treatment it ill usu lly r l e apidl and completely How er th mor tal ty and morbidity in these cases depend almo t entirely on the occu rence of infection or mas clotting in the hemoth r x

The xtens e ntraple ral use of penicillin has un fo tunat ly been asciated th a tendency to dis gard the p nciples of early nd frequent aspir a tion f blo d from the pleural cavity so that m ny cases ema n virtually unspirated for a cons derable period

T o fai ly distinct types of clotted hemoth x have been ncountered On shot s roentgenol gically mult pl pockets ntain ng air and fluid sep rated by brand ba d or sheets f fibrin The pockets a e often sh t ffr m ach other nd th r c nt nts m y vary from st ril ser u fluid to frank p The sec nd a ty ncountered is the ma i e clot Ia th s type the clot s usually in one piece or relati cly small number of piec s sometimes gh ng as much as a po nd

The d ffe nt appear nces f the t o types a c due t the p esence of air in th pleural cavity in the ly tages S ch air may have com from the lung r thro gh the ound o it may ha e been i t duc d i t nti nally d r ng a i replacem nt It is u lk ly that gas p duc d by a aerobe o ganism can h liv acco nt f r the diff rences as manv mul t i cul ca es a este l while infect on f a mas i e cl t ith ga f r m ng o gani ms gi es ris to a sp gel ke appearance roentgenol gically Gas fo ming org n ms u doubtedly acce t ate the ap pe anance of the multilocular variety

Th phys cal signs of the clotted hemothorax are essent ally thos f plural fl d In the multil lar case r a f tympany and dullne s may alternate B eath sou ds a e usu lly b e nt but somet m th y are present a d then ar bronchial in har cter Th occur enc f br nchi l breath s unds d p nds n the st t of the und rly g lung th y are most s lly heard wh n the lung i at l c t c

Th ro ntgenol gical features a sometimes d s t act e b t are commonly th same as n any pleu ral eff usion In the multilocular cases the app ar nce f mult ple fluid l els is character stic but the cond t on m v s mul te th shadows thr wn by the l me tary t act so th t a daphragm tic hernia m y h su pe t d Lat r ca es w th massi e clot tng h w a b ply d fine l opacity s rganizat n and c ntraction p c d and sm ll cl ts may s um an o al ph cal shape r embli ng a che t all t m r or a periph l g th f the l ag

Th final d g i of cl tti g d p nd n the g nabil ty to a jirate blood n r so ble q tit es w th an asp rat g needle Small qu ntities of blood can be aspirated e en wh n a mas ve cl t i present because a little fl d blood is sh t off n l

culi in the l t T o often the a pirat n of t r r
thr eoun es f i f d b l o d h a i d t o the u less con
t nuanc l eon rative t me t w i t h u n f o t u n a t
delay i n the m p l o m e t f i m o e a c t i m a u r e s
The i n a b i l i t y t o p r a t e b l o d f r o m a h e m o t h o r a
does n t a l a y s m a n t h a t c l i t n g h a c c u r r e d
th a p i r a t n s t m a y b e t o o l o b e c a u s e a l l o
a n c e h a n o t b e n m a d e f r t h u a l i e i n t h
d p h r a g m a f t e r i n j u r y t o o s m a l l a e d l m a y b
e m p l y e d o t h e n e e d l m a y b r e p e t d l b l o c k e d
b s m l l f i b r s t a g f i t n g n t h e f l u d

Much b l o d c a n u n q u e s t n b l y b e a b s o r b e d f r o m
the p l e u r a l c a v i t y b u t e n i n m a l c a s e s t h e s
a c e r t a n a m o u n t o f o z i z a t n a b d h b o s t u s e
f r m t o u n t h e c a s f l a g r e c l e c t o s c n s i d
e a b l h b u s t u e f o f a t i n c u r s t h m a y
f r m a r r i t a n t c r t o f t n a n i n c h o m r e t h i c k
a o n d t h l u n a n d b t w e n t a n d t h e c h e s t w a l l
t p r d u c e a c o n d i t i o n s i t i b l y t e r m e d t h e f r o c h
c h t O g n a t o n w t h f i b r o s t i s s u f o r m a t o n
o c c u r s w i t h g r e a t r p d t y n a h e m o t h o r a a n d
a p p a n t l y t a k e s p l a c e e a r l y a n d m o r t n e
n c l o t t e d c a s e s

E l a d c o m p l e t e b l i t e r t n l t h p l e u r l
p e i s t h m t m p o t a n t s i n g l e f a c t r n t h p r e
n t i n f p l u a l e p s a n d i t s e l i m n a t n w h e n
e s t a b l i s h d

E a l r m t h d f t r e a t i g c l o t t d h e m t h r a c e s
a t t e n d e d b y i n c o m p l e t o r c o n s i d e r a b l y d e
l y d u g x p a n s i o n A t t h e b e s t w e c h m e t h o d s f e d
t o c n d a b l e d e f o r m i t y f t h c h e s t w h i c h i n l a t e
h i f c a u s e d v e r s p i r t o r y e m b a r r a s s m e n t L e s s
f o r t u n a t p a t i e n t s w e r e l e f t i t b e a r e a n d p o
l n g d p l e r l i n f c t i n h c h a s a g l y r s p n
b l e f r t h e m o r t a l t y a t t h e b a s e h p u l a

The e m p l y m e n t o f d e c o r t i c a t i o n w i t h s c i t i o n
d r i n g e f f i l l t h e b a s c p i c u p l e f e a r l y a d e m
p l t r x p a n s o n f t h e l u g T h e a u t h o r f e l c
t a n t h a t t h e m e t h d w i l l r e d u c m a r k e d b o t h t h e
m o r t a l i t y a n d t h m b d t v o f t h i s g o p l c a s e s

A n i n t e c o s t a l p o s t r o l a t e r a l a p p h t h r o g h
the s t h p c w t h r e s e c t i o n o f a s e g m e n t o f t h e
s t h r i b p o s t e r l y i s e m p l y e d f o r a l l b u t t h e
s m l l l o c a l e d c a e I n t h l a t t e r g o p t h m e s
s n i s p l a c d r t h e a f f e c t e d r e a G o o d w i d e
a c c e s s i s e s e n t i f t h e a p c a l a n d d i a p h r a g m a t
r e g i o n s a r e t b r a c h e d a s i l y B l o d a n d l o t a r
f i r s t r e m e d f r o m t h p l e r l c a v i t y T h e l u g i
t h e n f o u n d e n c a d i n a d m o t h m e m b r a n t h
l i t t l o n n p i r t o r y e c u r s i n T h i s m b a n

c a f l y n d u n t i l t h g r a y s h n n l a y o f
i s c a l p l u r i s e c n t e d A p l a n f e l g e
e a d l y f u n d b e t w t h e p l u a a n d t h f i b u s
c o a t a n d t h l t t e i s c a f l y e m d f m t h e
l n g b b l n t d e c t o n w t h t h e f i n g e r o r l a g
u r v e d h e m t a t e r t h c l o e d r w i t h a m a l l s w a b
a t a s a C e m u t b e t a k n t a i d l a c r a t i n g
t h e p l u r b t a n u m b I s m a l t a r s s e e m n
v o d b l e I t i d i s b l e t o t r y t m e t h e
c o t n f m t h l n g m m d a t e l a d j a c e n t t a
l u g o n d w t h b a l e d o r u h e a l d f o r t d o o
m r l y e s l t n c o n s i d e r b l p u l m n a r y l a c r a t n

A l l i c a t n o f t h p l u a t h e r t r a u m a
o p e r a t e h i c h t i l l p e r m i t t h e l a k e o f a t h
c o n l o n f t h e d e c o r t i c a t o n s h o u l d b e t r e d
w i t h f i n e c a u t g I f t h e d a p h r a g m i s c o v e d h a
f i b r u t s u e c o a t t h i s c o t s h o u l d b r e m d
t h e c o s t p h n i s i n s r e f o m d b b e a k i g d a
t h e b l t e a t n g a d o n s T h f i b r o u s c o a t g e
t h p a i t a l p l u a s h o u l d t h e n b r m o d a c o
p l t h a s p o s s b l T h i s o f t e n d i f f i c u l t t a k i
p u e l y m e c h n i c a l a o n

I n t r o s t a l d r a n g t u b e s a r o i n t d i u
t h a p c a l a n d b a l r e g n o f t h p l u a l c a t
T h a p c a l t u b e i s i n s e r t d t h o g h t h e h i g h s t a
a b l i n t e r c o s t a l p a c b e t c n t h v t r e b r a l b o r s
o f t h s c a p u l a a n d t h v e t e b r l c o l u m n w h i l t h
b a l t u b e (m e d u m h r e t a h t t u b w t h a s i d
b l) i s s e t a t t h b a n g l i b o u t i c h f i m
t h e l e l i m i t o f t h p l e u a l c a v i t y T h e t h o r a c
o m w o i d i s t h n c l o e d i n l a y r s

D n g a n d a f t t h e o p e r a t i n t f u n f
h o l e b l o o d i s e m p l o y e d f m s t o 3 p i n t s o f b l o o d
a r u s u a l n c e s a r y b e c a u s h o c k m a y b e t e
t h e p a t i e n t s a e o f t n p o o r o p a t i e r a b s a n d h m
r r h a g e m a y b s i g n i f i c a n t b u t r a r e l y s i c

P n t o t h a l w t h c y c l o p a m e n d o y g e n g i s
h v t h c l o e d p o t i e p r e s u e n t r a t h a l m e t h o d
h a s b e n u d n m o c a s e s W h n t h e f i s t l a s h a
h a l r e g n i t o s o i d e o r y g e n a d e t e r m a e
p l a c d t h c y c l o p o p a n e

I n t h f i r s t p l a c n d f o a s b n g a s d e m a t r a s h
b r o n c h o p u l u r a l f i s t u l a r e p r e s e n t b t h t b a e
o n n a c t e d t o w t e e a l l e d b o t t l e W h e n t h f i l
l s h v l s e d u a l l y b e t w e n t l i v e a d t h r t y
s i x h u r s a f t e o p e r a t i o n b t h t b e s a r e a n c t e d
b y a Y s h a p e d c o n n t i n t o a e l e t i s e t
p u m p T h e p r e s u e d c d a s a p p l y a s c a b
t l r a t e d t o 5 0 c m H g I n n o c a s s h o l d s c t
b e s t r e d u n t i l t h p a t i e n t p r o p p e d u p o p l l o
a l t e t h e o p e r a t i o n I f s u c t i n i s s t a r t d y w h e n t h
p a t i e n t i s h r i z n t l t h r e d a n g e r t h t t h e u p p e r
l o b m a y s e a l t h e p p e r c a t h e r a n d t h v n a t
n o r p c k e t f a i r s h t o f f o m t h e t u b S c t o n
m a i n t a i n e d f t w o o t h r d y n d w h a t h e l o g
i s f u l l y e x p a n d e d t h t u b a r r m o e d p c a t i n s
h l d b t a k n t o e t h a t n o a f i k a l n t h
t u b e t r a s a f t e e m o l f t h e t b e s

H e m t h a c c c u r d i n s 5 6 (7 0 p e r c t) f t h e
c a s e s m a r e s o f 7 5 0 h e a t j r I n f e c t i o n a w a
p r n t i n 3 0 p e r c n t a n d c l i t n 9 p e c t i
t h e h e m o t h o r c s J o e n k N a r M D

F a r n l y G R B l t I n j r y t r t h L g B r i t
M J 9 4 5 4 7 4

F p m e n t l e t d i e h a e l d t h a t t h p a t h
l v d e t v p l o s b l a t o n t h l u g s m n
f e s t d b p u l m a r y h m r r h a g e o f r y g d g r e s
o f s r t y f o m m a l l c a p i l l r y s r f a c b l d g t
c o m p l e t e h e p a t i t o n f t h i n g T h e s e l e o u s
e m t b e c a d y b t h f o r c e o f p i n e p e s a
d i r e c t l y o n t h e h e t w l l

T h p e s n e p o t a i n d c l i n i c a l a n a l y s i s
s u c h c a s e s c e d a t a b a s e h o s p i t a l f o m t o

TABLE I—SUMMARY OF CASES

Case	E l so ce pon	Tm sci	P	Co gh	H mo ys	Signs h	% food gvi h
1	A rial bomb y ds P on		d l os	days	h days mu	N l d gth 7 h t days	N l d 6 b h 5 h d y
2	M bomb 3 f Fas ng	8 h rs	5 d ys re ros rs l d y pe bd m	d ys blood	h days interm t	G l h hi 3 d	N l d 3 d h b h day
3	A rial bomb y ds F		5 da ros rs l	h days m d pu tum	d h d m t	C nos hype pa d g l h h da ml d da la	N l d 6 b h d ys
4	Lan l mu ds Lef d	5 m us	d ys righ bes	days m d pu um	h-p h days d l	N l 3rd, 5 h 9 h days	N l 4 h 7th d vs
5	La d m lov S pu		6 days d h k os m l	5 d ys blood pu m	5 h d ys	N l d, h, 7 h days	N l 6 h h days
6	f ta bomb y ds F	5 h rs	d wh ? he	5 d ys blood	5 d d ys d l	G alized h hi da ml 3 d 5 h 7 h days	N l 3 d 8 h ds
7	M bomb ?	h	7 da h l hes l f rm	3 d ys blood	3 d d	Ge alized h h da l 3 d 5 h h days	N l 3 d 5 h ds
8	M rta bomb y d	5 h rs	3 days ppe b- d m l f b k	3 da dry	3 d d	N l 4 h 6 h d	N l 4 h d
9	Gre ad y da R h l	F mu	5 d h h h	3 days fro hy pu am	d y	N l 4 h 6 h days	N l 4 h d
10	G d Lef d	Sh m	7 d ys l f h 3 m	7 da m oed pu m	4th d vs	Ge alized h b t d y	N l da h loh fl d 3 d d
11	R h bomb? ?		5 d y l f h	da blood p m	da f 6 hours	N l 4 h d ys	Inc ased d y l f l to 4 h d y
12	A l bomb y rd		4 d ys l f h	5 day m d m	da	Cy os h d b th an h 6 h h d y da ml	Opa d bo h mu lzo h l 8 h d
13	A l bomb? Back	F m	d ys os l	d blood	d	G bzad h h da dull es d d m h d BS l f bas 5 h d	O d l f l d pa l ng 8 h
14	A l bomb ?	7 h rs	d vs h bes	d	d	D ll ss d d m h d BS h base da dim m h d BS d righ base 3 h da pe	H vy p h l so mallopaci l l mud so 3 d d y l run gh l l 3 l h d 6 h
15	Fl bomb ?		days h l h	Ch b h		Lef h mo h 3 d da as d	Lef hem h ra l h 4 h d
16	Sh ll d B k		3 d l f h	d ys dry	d	Lef h m h d d y d l 3 d d no l da so l f b h	Lef h m h d day pl sold 3 b d pl l b k m g d da
17	M rta bomb lune I rench	Few m us	7 da l f hes	3 d ys d		N l d d dull es l f t base h da	N l 3 d da pax l f h d h da lmos lea b
18	Fl ng b h B k		d vs re ros rs l f b k	3 d dry		N l d d days, dull dim m h d BS d pe gh base 3 d d ml 4 h d	N l d d 4 h d y
19	M ta bomb 3 rd Le d	h	d l f bes			N l d y, d ll es d dim m h d BS l f base 3 d d ml 8 h d	Op l f f base 3 d da lea d 8 h da
20	Aerial bo b P	6 h rs	d ys l f bes la k pe b- dom			Ge l sed h h da consol da righ h se th da evolvi sold so l f base ta h da	Lit h l midso pact es h > l l 4 h day opa l y l f b se 4 b d
21	M bo b d Crou hang		days pe b k			Cy nosa, ma red reps ho h l rs d nd d ys d l ess d dim bed BS l f base h	I ased d l f lo so gth d y l th d

f urteen d ys ft ound g Th o c f i j v
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 mu cles f the ppe abdomen or tho e f the back
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 and h dan in ers el ti nship f the symptom
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 nted pne m

P J MEN G P S M MD

Pilbury N R d Wa rs g J D Th D f
 f ntl d n of B nchlog m C clinom nd
 Pulm n ry Tub culo l V E gl d J J 945
 3 76

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g In all cases in which th racic symptom re
 p es nt x ray xam nati n f the chest sh ult be
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J B N MD

Holl g P H Hara H J nd Hirsch E F
 B n h g nle Ca In m An A ly l f 193
 Pro d Ca s A Orl Ra l 945 54 5

The a th r s pres t comp eh n e t d y f t
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Th th r s t t th t th t u lly m d
 d th r pati nts ft a bl t st t th
 ct d t f th t f mpt m

In order to identify the symptom in the res-
cued child suspect of tuberculosis the
physician usually presents the ly-
stages. Rx given generally the extrame var-
n in the find. No single find or group of
finds can be considered pathognomic but
evaluation must be considered to be the most
accurate of the procedures which lead to a presum-
ptive diagnosis of the disease.

Bronchoscopic biopsy should be done in all patients with obscure pulmonary pathology in the hope of firm diagnosis. Thus procedure has been successful in approximately 80 per cent of the cases.

In the series of cases reported squamous cell carcinoma was the predominating type and comprised 64 per cent, followed by the carcinoma small round cell carcinoma, 17 per cent, anaplastic undifferentiated carcinoma in 6 per cent.

The treatment is primarily surgical although the method of treatment at some time used such as surgical diathermy and the direct implantation of adrenalectomy or adrenalectomy into the tumor. These methods are not suggested as a value in case of a desirable.

JOHN F. DELPH, M.D.

HEART AND PERICARDIUM

B tch lo T M nd M n M E Congenit
Glycog l Tum ra f th llea t i h P th
Ch 945 39 67

Cong n t l t m r s l t h t (habdomyoma
r c mpa t e l y r a e S n n R k l g h a s e
descri bed the first ca e in 862 62 with t c a e
have been c d d The cardact mors were cer
ch sly in fa ts nd the ne b n with 52 pe c n
f the pat ents dy ng n the first y ar flf nd 86
per cent bef re th r ch d n b ty

[illegible]

The report by the authors states that an American literature of the third in the general medical literature. In a case of multiple forms of the same day-old boy glycogen storage disease the tumor cell

These results suggest that the transition from congenital hyperglycemia to diabetes in the rat should be delayed until more than 1 year of age.

J SEP 1 K NARAY M D

Straus R and Mills R Primary tumor of the
Heart of the Chick 945 39 74

Reports of primary tumor of the heart appear frequently in the literature. Because of the reluctance of students of the subject to accept the diagnosis even in some of these reports, there has been a considerable variation in the estimate of the number of cases that have occurred. Numbers varying with the bias of the author. Apparently only 163 cases have been reported to date. In a dual percentage varies considerably, as among 30,000 utopians, no cases have been ascertained to report whereas others who have reported 3 cases of primary cardiac tumor among 200 autopsies.

The site of the tumor may be in practically any part of the heart but the tumor is found less frequently on a valve and most commonly in an atrium. Apparently it may be either single or multiple. It is graded that in all cases of tumor of the heart the neoplasm is of mesoblastic origin and the following have been reported as a myxoma, fibroma, lipoma, lymphangioendothelioma, hemangioendothelioma, leiomyoma, rhabdomyoma, rhabdomyosarcoma, leiomyosarcoma, fibrosarcoma, polymyxoma, chondrosarcoma. According to the literature the disease occurs at least frequently among males as among females. The age group is chiefly affected but ages have ranged from ten months to twenty years.

As a rule the most frequent finding is a primary cardiac enlargement. In the majority of cases the heart is enlarged. On the other hand there are many cases of a small heart. The most common cause of a small heart is a small heart.

Whether or not primary tumor of the heart can be diagnosed prior to death will depend certainly on its ability to produce symptoms by interfering with the cardiac mechanism. A small slightly enlarging tumor for a member of the heart and in some cases a large one may not of the very position would not be physically large enough to be expected to produce murmurs but ones suspected would certainly be overlooked in the differential diagnosis. A large tumor of an atrium with a ball a valve defect in either the mitral or the tricuspid regurgation with murmurs affected by a shift in the position of the heart would certainly be amenable to clinical diagnosis if kept in mind in regard to cardiac changes and symptom most likely to be produced would be hemorrhage pericardial effusion etc.

three hours for three days did not improve her condition very much. A pericardial paracentesis was then done, 70 cc of turbid blood being removed and 400 units of penicillin were injected. 3 cc of normal sodium chloride solution was then injected hourly, the temperature dropped to normal and except for an occasional flare-up continued in the same manner. The intramuscular administration of penicillin was continued in decreasing doses for four or five days. The patient was discharged as cured on her thirty-fourth hospital day.

It is the opinion of the authors that this case represents a purulent pericardial effusion secondary to lobar pneumonia which failed to respond to sulfazapyrene or penicillin given intramuscularly but did respond dramatically when penicillin was administered intrapericardially.

B. NIMMY GOLMAN, M.D.

ESOPHAGUS AND MEDIASTINUM

Bergs E. J. Cancer of the Esophagus. *J. Surg.* 94:6-88.

An analysis of 53 cases of cancer of the esophagus presented. These cases were admitted to the T. A. Memorial Hospital in Bombay during the period from March 1941 to December 1942—twenty months. The type of cancer was 48 percent of all malignant cases admitted to the hospital.

The youngest patient was thirty years old in fact; the youngest age group between thirty and thirty-nine years. The males predominated—154 men to 9 women. There was also a marked increase in cancer mortality on the third of the total number of cases coming from one community or tribe.

On hundred and forty-one of the patients had dysphagia as the first symptom. Eight had initial symptom and hoarseness and gastrointestinal distress as the first symptoms. Only 55 of the total number of cases had symptoms of less than 3 months duration.

Analysis of the histological sections of the esophagus revealed 83. In 26 cases the lesion was benign, but in 57 cases it was malignant. In 69 cases the lesion was benign, but in 57 cases it was malignant. In 69 cases the lesion was benign, but in 57 cases it was malignant.

those about the left gastric artery, being most commonly involved. All but 2 of the cases showed squamous or epidermoid carcinoma, there being only 2 cases of adenocarcinoma.

The author believes in radical resection whenever it is possible. There were 4 cases in which a resection and an esophagegostomy was done. Three of the patients lived in the postoperative period and the last survived 6 months before recurrence was fatal. Four other patients had a radical resection and cervical esophagegostomy, 3 of these died in the postoperative period, but 1 survived the operation and died 6 months later of amoebic dysentery.

Any therapy may be helpful in some cases as it decreases the edema about the tumor although in some cases it seems to increase the edema and necessitates an earlier gastrostomy.

FORREST D. DODD, M.D.

Tomlinson W. J. and Wilson L. A. J. Esophageal Carcinoma in British West Indians and Panamanian Negroes. A Study of the Incidence, Etiological Factors and Pathological Anatomy. In *50 Cases Arch. Path. Clin.* 1945, 39-79.

In recent reports of esophageal carcinoma it has been suggested that this tumor is far more frequent in white males especially in those of Jewish extraction than in West Indians and Panamanian negroes. The authors are presenting the data from complete autopsy cases of esophageal carcinoma occurring in negroes, Indian and mestizo proportion of British West Indians and Panamanian races. Forty-five cases in men and 5 in women. The tumor was located in the upper third of the esophagus in 5 instances, in the middle third in 5 and in the lower third in 2.

Of the 50 persons with esophageal carcinoma, 26 had clinical and autopsy evidence of syphilis and 22 had recognizable syphilis. A decision could not be made in regard to the remaining 2. The average incidence of syphilis in the entire autopsy population for the past thirty years is 8.7 percent.

In the 50 cases of esophageal carcinoma studied, the pathological lymph nodes were grossly enlarged in every instance.

In British West Indian negroes carcinoma of the esophagus rarely develops to the number of cases among all the types of carcinoma observed at autopsy.

JOHN K. NICHOLS, M.D.

this region as well as the vas h to th spl n
and the gr t m tum also g the eat r cu e
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B mobilizat o f the d o d n y l It can h
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th tw pening the s t r lin being cove d by
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Christian T. Lo t perat v G tris G tro
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s n d 943 5 496

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f i c i a l h y p r t r p h i a t p h a c e r s d l e a t e
l s o n s Th c l i n c a l m p t m s d i f f e r m y r

pect f m peptic ulcer for instance th pain i not rel eed by food intake The question of pathog ne sis open to gum nt and diff rent theories are discus sed

E rope n and Am rican a thors d ffer in their p n s concern g th frequency of the disease In Europe i s cons der d s b extremely frequent her s Ame rican workers (Eustern n and Balf r M v Clin ic) belie e t to b rare The author tries to acco t for this d v gence of op nio by the fact that the E ropea wr ts base their d agnosis upon gastrocopic findi gs whe e in Ame ca the d ag nosis is bas d on cl nical symptm

Te ca ch t es a c r p r t d and d scussed g l th ca es occurred after gastroenterostomy d s after res cti n Th pati nts d velop d cl ncal sympt m f gastrit s f m two to thirty years after the pe t n l ng of the case gastroscopy r v l d typical g tritis whereas n i cas nly n gast i tis as found by gast oscopy The lesions were local d mostl at the toman d at the anast mos of the ntest e There may or may not be f ee hy d ehl ic cid The pognosis poor

Although som cl ncal improvement was achie ed by comba t n of the Sppv tr tme t d daily g tric lavage no improvem t of the gastroscopy findi gs uld be bserved after the t eatme t M cin t e tme t e med to b ineff ct v

WEX 2 M SOLMITS MD

P l P B a d L e T F Th Use of Omentum to Cl s P r f rati on of th Stomach 4 h S g 945 5 7

It s common p act ce to cover pe forated ul rs f the st mach w th tabs form tum e p cally hen th adj cent gastric l iast i d rat d and i b l f rsati factory closure of th h l w th sut esal n F me tal t an plants grafts h e been r c omm d d f ths purpose b t on the tical grounds it may be quest d h th rth p dure i sounds g cal practice One mght exp ct the f e t an pl nts d p iv d temporarl f a blood up ly to b c pt the loth to th d gest cti on f g stric ju c and to infect n which ure t b pes nt t least j a t of th t me In th cas the aftr proced ould b to c e the d fects w th nily ng omentum h ch p r umabl y ould sfer g eater es ts ce t both d gest ion a d inf t n

Thea th rs have st d d th problem e p me tall on d gs Witha p t technique n l) h les e cut in the ather ga t c w ll Th h les were l l b t l y made l rger th n th pe forati ons enco nter d cl nically becau e t w s desir d to s b ject the cover g omentum t r l t ely e test ad al be use m ll h l s in the n mal g st c w ll h l too rap dly to p esent th p obl m pos d by th m r slowly heal ng p r f a tions f pept ic r C tton the ad was u ed fo s t es and l ga tures All the n m l s w e all wed wate and food (d g pell t) ad lib tum after op ti on

Living m t l patches o tab we u d success full t covr l t v l y l g h les n the st m chs

of does S ch seals appe red t be h ghly rer stant to digestion and infect n and gave the g stric de fects time to heal

On the other hand free omental transplants s mi larly employed bei g t mporarily without any blood supply we found to be susceptible to infection and the corrosive action of gast c juic Necrosis ad pe f ti on of th graft occur d n many instances

These experim ntal results suggest that in cl nical urg cal p cedure it is mo e atu nal and safe to us l ving t ssu than free omental grafts to e r p rfo ad g atric ulcers or to re enforce l n s of anastomo is

JOS H K VAR T M D

Cust r W C Survival aft Gastric Resection In Ca cin m f th Stomach S gery 1945 7 5

O r a f teen year perod e pl ratory laparot omy for ca cin ma of the t mach was pe rformed on 463 pat nts Of the e 41 e e cons dered to have pe bl lesions a d gastric res cti on as per rformed The f llow up clinic a abl to ca ry thr ough a tudy in 96 ca e hich can be class hed s follows

Operat ed ths	Numb r	
F tal post pe atu plicat	9	9 37
D ths d th y s (t incl d g bo v)	3	3 95
P u ts failing t h e e years	34	35 34
D ths th three to fi ye t r v l (s p u ts died f th ca se nd had d ce f rcur c)	36	37 59
D ths th fi to e ght y t r v l (pati t d d f th ca nd had e v d f cur c)	8	
P u ts t u a d w ll f ght y rs	8	8 75

To sum m rize there e 4 pati nts ith an establ sh d diagn is of c rein ma of the tom ch on h m g t r rsect as petio med After fi e ye 27 06 per ce t w al e and fter ght ye 18 75 per ce t w e till liv ng In contrast the e wa a group f 8 pati nts in whom the d i g nosis of operable gast c cancer had be n made i ho refus d urgery The n o tality of this group of pat t was too p c nt at the end f th e e years

JOHN L. LANDQUIST MD

E g t G C Th Creation of a Gastric Po h f l f wt g Total Gastrect my S g 945 57

Th r p t deals with one f the problems foll g total g trectomy nam ly the nability of s me pat e ts with n e oph g jejuno stomy to handle v mall fe d ugs without a fe l g of f lness and d scmf r t b cau of the la k of phys cal space in th j jun m to e commoat a mod t ized me l Th symptoms of d st ess in the case p es nt ed w r ot d e t cont cture stenosi or pasm f the esophago j un l ana tomosis they we e r liev d by e d r y operati on creat ng a pouch ut of th sfer nt and aff ent l ps of jejunum The pat ent was a fifty even year old m n wh had a la ge peptic ul r n the less r curvature f the t m ch in v l

cat s itl illu trative cas s The indications f r
primary res ct n a

Pe f terd carc no ma f tl st i ac l at l
lcl mite i res ct able lesions

2 Terf ate l p pte ule rs as acrat d ith rec nt
s m lt eous gross hemorrhag

3 Perf rate l peptic ule rs a ocated with fix e l
p l or c bst action

4 Recurr ng pe f rations

5 Ierfo at on with ins gnificant soil ng

6 V ry early p fo at on occurring in the ery
ung

Probably under no circums tances should r secti n
be und taken unless the pat ent is in fair cond t n

r f ably young and the perf ration of n t ov
t l e hours d rat on

Acute p foration of a ca cinoma of the stom ch
nto th fr eper t eal cavity is not c mm n but the

auth was able to ellect 2 7 cases from the l iter
atu e in wh ch the d agnos s had been est blishe l at

op ation postm rtem exam nation f n l v 7 of
the 27 ca es i s it alleged that a corr ct d ag os

h d bee made pri r to perat on o postmort m
e m nation Mo e astonish g was th f q ent

f il reio eogm eat peration th t perforat n h d
occur l n a carcinomat us crater instead of a be

ng peptic ulcer Thus w uld indicate that many of
the carcinom s which pe forate are small and rel

ty ly confi les n p esum bly ut bl for
res ct n The two n st mpo t nt problems lat

ing to perf ated care n mas of the st mach a
tst recogn t o of the ca cinoma by t tin biop y

and seco d ope tive man gement in pp o
mately 50 per cent of the ca es a lopes t n n

exsts i caus of a l v ne d perito us from ept m
s l gordelay d int r t ion of b ca e thet mor

n t res ct able The d fficult es l s mple clos e of
these perf ratio by utur is appa nt It is th

auth s opi on that th hazard of g trect my
the pre nce of a d ff sely oiled pe it heal cav t

h s b n gro sly overest m ted and the haz d f
l akage f m a sutu ed perfo at on n ca ci matous

t ue mu h understim t l

When perforated p pte ul as cat l y th
recent o s multa e us h mor hage the h mor hag

cont butes enormo ly t th mo t l a d t
appear that s mple cl su e of th pe forat n

ad q ate beca too l t n f a l t c ntr l the
h m rh g Postm tem c m n t n h bown

th t thes pati nts oft hav m lt pl lcers a d
th t hem rhag u u lly ari es fr m th nper f

rat d o e Th f g st ic es ct h h r m
mo es the t ulce be ngaree and ll es f

h mor h g s nd cated these ca es

Repeated or recu nt acute pe f ti n
ncomm n b t p t is n th cat g r v d v l p

ery acute ul r h ch perf rate th l t l l
w n an l man f th n ha n lc d atbes

and ev nt lly requi res ct on lns h as st h e
s adeq at nd cati n lo em ge cv es ct n at th

s m f th econd perf rat n if circums taces re
fa rable

M t of th p loic l st acti ns s cated itl
perf rat n a e due to inflamm tory lema th l

raf lly i f d s in ost in tances f l l win j r
at In a f ca e the l st acti n s fied or j

man nt as the result f carr g In thes ca e a l v
tass mu t b l i l l a l l r t l purpo e gastroen

tero t m v a poor ce nd choic to esct on From
th e lence a a l l b l the l terature s mple closure

f j r f ated j j nal stoma ulcers ca rie a higher
m t luty th n the subtotal ga tr ctomy or d s

conn ction of the gast oenter stom y

The maj rty of pat nts under th ty f e years
of age who suffer from acute perf at on do not re

main fr e of ulcer symptoms f llo ng s mple cl u
and n many instances have recurrent ulceration

necessitating su g cal intervention In the nd of
skilled urg ns r ect on in these patients ill e

attended it l tle o no mor primary mort l ty
than s mple cl sur and the pe cer tag f pe ma cnt

cure ll be m ch higher

From avail bl stat tical data it appe rs that
subt tal g str c esct on can be performed in th

presence of diffuse soli g of th p t ion al e ity
with nt elve h urs after the perf r t n of ule at

l gle so so f the upper g stro nt stinal tract ngoo l
n k cases with a lo r mo tal ty th n that obta ne l

by s mple cl sur with sut es The incidence of
r cure f ulcerati n f llo g s mple cl sure is much

gh than that f llo g resct n
J r n e L ndquists M D

Coll F A nd Vaughan II II The Treatm nt
f Carcinoma of the Colon t S f 945

395

A s es of 373 pat ents with c rcnoma f the
c l n wh we e t eat d by op ration is ept t lly

the uth rs

Of these pat ents 16 2 per cent presented le n
b y nd th reach f resection so h ch only f l l a

t e per t ns could b ca ed o f R e t ion f
the p m r les n v as undertaken in 83 8 p e t

of the j t i s Of th latter 19 p c nt had oth
gro m tastases n the l vero perit n um th t re

b vond u g cal r m al The e f the resect n
th s g p w e p l l at e n nature

In 12 pat ents (6 2 per cent) es ct n was u der
t k n with ut ev denc of g os carcinomat u

p d b yond the lymph nodes in these cur mght
l e h p d for Death o c r d n nly i patient in th

g t u wh ch the e was a chance l operative cure
t ce r d fr m ad anced d a foll g

g e at e att mpts to rem wid p a l les ns
The uthors bel ve th t su g cal method m t l

d adual ed t meet the ary g condit on of
d ase

The two tage p at n at f ctory m t
ca es f cane of the right colon Small lles n m y

l resected in one tage by the expe enc d p rat r
l br l l a t results f th l les n f d e nfect d

or xtensive a dr q reswid d s e t n v th em v
at of the m e colon and th abdom nal w ll th val

e of the two st g peration emph c l If

TABLE 1—COMPARATIVE MORTALITY—ACUTE APPENDICITIS

Se es	Y rs	Sm f P en	P f ra wh bscess P ee	P of ra ve wh ge rature P toni	P of ra 'e wh loc l pe P nu	All pe f ra P
U l eay l l so Hospital pelng & M h	92 34	99	6	43.4	9.5	
U rs y f M b ga Hos t Coll & P	3 3	6	37		5	
U rs y flow Hos tal P so A C	9- 34	3	8.6	43	4	
V nd b l U Hos tal H gg rd & k l y	5 3		4	36	8	
C Ge ral Hos t K d & Monta na	34 3	3	o8	7		
B Neve Hos l Sl ry & Hl	8	6	7	33.3		3
J hns H pk Hos tal S aff d & S on			7.06	4		
Cha ty Hospi t New Or l na Barro & Och	94					7.3
D ham N h Ca d	3		8.5	4		
Roosevel Hos l N Y C Smyth	0-					
Cleval d W h	30-	7				
Brook Ge ral Hos tal F h & B h	0- 44					

TABLE II—APPENDICITIS—BROOKE GENERAL HOSPITAL—PATHOLOGICAL DISTRIBUTION

Appe d c i u s	cut	pp	ti	impl	645	} P r f t u
Appe d c i u s	cut	perf	t	w th		
Appe d i c t u	cut	pe f	rat	w th	34	} Appe d i c t u
g l t a l	cut	pp	ti	pp d c t u	39	
I t r v l	pp e d c i u					7 8
f a d t l	pp d e c t m					6
C a t i	d f i l h	pp e d i x				54
A t o m y c	pp e d i x					4
T b e r u l	pp e d c t u					
D e c i d l	t u					3
O r y u n i n	pp e d i x					
T t l	pp e d e c t m e s					404

c m p l c a t i o n o f p h i l e b o t h o m b o s d p u l m r y
m b o l a t i n W o u d h e a l g w a s s a t i f c t r y d
n e v e t a s c c r e d T h p a t t t l r a t d
e l y m b l a t i n e l l
a c u t e p r i r a t i a p p l e t p t i w a s
d f e r r e d u n t i l e s l t n a b s c o c c r d S
g a l d r a a g e w s d e o l y w h e t h a b s f l e d
t r s l W h n t h a b s c s w s t n c t t i t h
t h a n t e r r i t a l p e t u m d a g a
m d e b y a p o s t r o e t r a p e r t o n e a l s t b w d
O c c a i n l y i t w a s p s b l t r e m o v e t h a p p e d
i t h t h a b s c s w t h o t p i l l H o e v e p p e
d e c t o m y w a s u a l l p e r f m d a f t r c m p l e t
r e c v e r y f r m f r n t i s

BE. JAMIN G P S DE MD

LIVER GALL BLADDER PANCREAS
AND SPLEEN

B y d n E A and L y n J A The G l l B l d d e
n P a t i n t s w i t h P n c l u s A n e m i A S t u d y
I n n v i u a l t i o n n d t h R a t o f E m p t y i n g
G l l l l z y 945 4

In a preliminary study the authors observed that the gallbladder was visualized in 43 per cent of male patients with pernicious anemia as against 22 per cent anticipated in normal male patients. In a larger series of 48 patients with pernicious anemia the gallbladder could not be visualized in 4 per cent namely in 8 of 23 male (35 per cent) and in 12 of 25 females (48 per cent). The expected incidence of failure of visualization for this age group was 26 per cent.

The authors examined the protocols of 95 cases of pernicious anemia among 313 consecutive autopsies and found that 3 percent of the patients had had a liver cholestasis or cholelithiasis or that the gall bladder had been removed.

The rate of emptying of the gall bladder in the group that could be visualized revealed a significant difference. In the male patients the curve of excretion was significantly different from that of the control. However, in the female group there was a highly significant reduction in the gall bladder having discharge a day for only 69 per cent of the control in the first rhythm after a standard meal as against 84 per cent in a control series.

The authors suggest that in some cases permeability of a membrane may cause permeability of the cell membrane.

1.3 O L n M D

Fanny J M T Jr and J hns n M L Primary
Carcinom of the G n Bladd A S t
945 4 3

The a th rs port 18 cas f car n ma of the
ball bladd r se n n n hopt l ten years The
pat ents w m les a d 6 f males Th mayo ty
of th m nged in g fr m 1 ty to ty n n
s The rsl alalt r pe at nestabl hung th
d gnos a vshort bl cdl sth emo th
3 f r on to three mo th 4 f om sou to s x
montls f om ex n to t le m nths f om
th te n t ghteen m th a d i for twenty fi e
m nths

Th n id ne f ca c nom f the gall bladder
mpa d to all gall bladd c nd tions for high
p r t i ere undertaken in the authors ho p al
n ten e r wassl htlv 5p t The mor
talv tti th s r s yes a 6 per cent elev
f th ca c omi I car n mas o gnat d
n gall bladd r s that had been drained aft the r
mo al of t nes

The authors concluded that diagnosis is difficult and treatment of renal colic is because of the frequent use of stones per cent car nma f the fl bladder (from 75 to 80 per cent of the cases) the authors suggest that the gl bladder is on a g stones b n th d g n i first m d r m d

East O. L. ry MD

Curr J F Complet Rupru e f th P cr
B f J S z 045 z 186

The author gives a detailed description of the
 composition of the pre-hydromineral
 contents. The patient was able to walk to the hospital
 with upper abdominal pain and rigidity. He
 observed in an exploratory laparotomy at my hour
 after 13 hours. At operation there was a
 amount of fresh blood in the peritoneum. There was
 a right retroperitoneal mass. These
 blood vessels of a branch of the middle of the
 pancreas was completely split. The
 totally always exactly through the entire
 ganglionic he became the distal
 transverse colon. The end of the
 the for a central deep matter uterus was not
 the raw surfaces. The only had cut the
 pleura which was ligated. The
 entered the and was closed.

a panc at c f t l a d e l o p e d b i t t l e c l o s e l f t
 n e e k p a n c e a t c d r a g d e a d n l w
 p e n d t d i n c r c j a l n a d t t h
 p a t n t h a d l o t i r a b l b t l g t h n
 e e k t h a t t h p a n a t t l o p e a f t e r
 l o s e o f t h f t l a t h l t a r m d n m a l
 i n s l s t h l y t n a l d i b b i t t h t
 m e d w s s m a l l n e a n l h r m

JOHN H. G. ST. J. M. D.

Mo t n J Acut P creatiti S gery 945
475

By means of the method of determining the blood amylase level at 15 minutes after the start of the test, it was found that 80 per cent of the adults had an amylase level between 80 and 100 units per hour.

There are two pathological types of acute pancreatitis—*the milder chronic acute pancreatitis* and *the more severe type*. The first is spontaneous if left alone the second is a

Th myla test a ds nestabl lungth d gna
facute p nre t tis B tudy; the co rs i
hosp tal acut pancer at c edem can be d ftr
tuated f m h m rhagic n eos of the pancre
Ther mern ally g ce h t r ipe u attack
les p ost at n t h n et d a h g m h
re d g Ove the urse f thr t fied vs t
att k s b des spont neouly Pancre t c n
on th th hand s almost always p ostr t g
the start the amylase al es r v or may n t
le ated the p t n fal t imp ewth t s g
cal nte entio

The demat u typ is trated conservati
du n the tt ck a d later th gall bladder s
mo ed the comm d ct e pl red th ph
ter of Odd d lated All es fpanere t necro
demand pe at o as soon as the diagnoi s mad
a d the pat e t is pr pa ed Th necr t c t u
should b g n chn e to e tr d t lf b e
helo th st m ch through the ep l c m
lf the comm d ct a bl ch d t eould be dr e

After becoming familiar with the myla test the author treated 39 cases of pincer at c d m c ery t cly with ut dc th

EARLO L GLEND

MISCELLANEOUS

Hughes F and Lambeth S S Pulmonary Complications following Appendectomy and Herniorrhaphy. *Surgery* 94:57-533

H gh es nd Lamb th ep rt th pulm ry cor
placat ons f h f 400 per t f r h m a
36 op t f ppend ctis n th Stat
Ho p t l C mp R k Al b m All f llo
l r ab d mal ope t n e s h lly y me
b t e c n ght n a d f t n e s fag d u t
p l al ansth a (50 mg m oca) u d t
l l Thed f t t u f l t ct b ch d s par
m t i and b l p e m n s d p e i
p n cl c l ob r v t n w th oc tgen graph
t d

The e 35 c (46 p e t) f g l m n
 c m p l c a t n . 5 5 p e t a f t h r h
 d 3 3 b p e t a f t e a p p e d t y
 Of th compl c a t n s l l g h i v
 a t e l t a s l r w t h p n m t s f d
 i n s t a c e s h a s b r c h o r n m n b o

of it f u n i s O f t h e p l a c a t i o n f i l l
n g f l a t i t p e r a t a t l e t i a l t l
t i a f n i s i t u n c e s f r n i l i
i n r l n c h t i n 7 a n l l b u l a r f a r c t
f u n d i n i c a

S p l a n e s t h a a s u d u t i n l y n l t i e
r 32 (48%) c m p l c a t i o n s a f t e r 67 s i n a l
a n e s t h e s a s a n d t h e w e r 2 (39 p e r c e n t) c o m p l c
c a t f o l l w i g s i s p n a l a n e s t h e s i a s s u p p l e m e n t d
i t h g e n e r a l e s t h e s i I t s g e n e r a l l y b l e d
t h t t h e a n e t h e t i c i n o t a g r e a t f a c t o r n c a u s i n g
p u l m n a y c m p l c a t i o n o r t h a t p i n a l n e t h e s i a
w i l l p r e v e n t p i m n a r y c o m p l c a t i o n s

T h e r e w a s n o m o r t a l i t y i n t h e 76 c a s e s
T h e p r e v e n t o f p i m n a r y c o m p l c a t i o
p o s s i b l e b y a t t e n t t o m a y d t a i l w h c h i n f l
c n c n d p r e l p o s e t i t s o c c u r r e c e I n o n t h i r d
o f t h e c a s e s t h e r e w a s a h i s t o r y o f r e s p i r a t y i n f e c
t i o n t o o t h i n f e c t i o n r e s u l t s i m m e d i a t l y p r e
t o o r a t t h e t i m e o f t y o n T h e f i t n e s s
i n f e c t i o n i n t h e n e m u t h o r e s p a t o r y t e t a d
a l a p s e o f f o m s e n t o f o u t e n d y s b l e r o f r a t i o
i s d e s i r a b l e I n c u t e p h e o f c h r i c i l
m o n a r y i n f e c t i o n i n t h e p r e s e n c e o f b r c h i c t
s h o l d b e a l l o w e d t o s b i d e c m p l e t l y T h e p u l
m o n a r y b r o c h a l s y t e m b e f o r e d u g a n d a l t
t h e o p e r a t i o n s h o u l d b e k e p t c l e a r F o r t h e s e l r
a b d o m i n a l c a s e s t h e p a t i e n t w a s k e d t o c l u s e
b r o n c h i p i o r t o o p e r a t i o n a n d a s l i g h t l n d I n b g
p o s i t i o n w a s u s e d d u r i n g t h e o p e r a t i o n T h p
t e n t s w e r e u s u a l l y e n t i l a t e d a t t h e e n d o f t h
o p e r a t i o n w i t h c a r b d i x i d e a n d t h e i m p r a n

f l l l r e t h i n g g l n p e t r a t i n g n l
i n g t l l g s t r e l l i c r e c i a l
t g l a n l v c t l n c u g l g W l i
l r c h u a l s c r t i n a l u l y p e n t a n l t l
t a t t a l i g d d i c u l t y p e c t o a t i g c a b o n
d i d a d o v i g n e n t i l a t n a s g e n t w i c e
d a i l y

T h i s c h o l g c a l i n h i b i t o f c o g l u n g c a n n o t
b e v e r e m p h i z e d C u g h i n g c a s e s a p p e a r i n t h e
r o u n d a n d t h e p a t i e n t t h i n k s o f t e a r i n g t h e r i a i r
w i t h t h e d e c l o p m e n t o f a n t h e r h r n n a w h c h i s a
r e l t a n g i b l e e x p e r i e n c e w h e r a s h e p r o b a b l y h a s
n e c h a r d o f p u l m o n a r y c o m p l c a t i o n I n t h e
g r e a t n o r t y o f c a s e s t h i s c a n b e v e r c o m e b y
u p l a t i o n b e f o r e p e r a t i o n r e p e a t e d d u r i n g t h e
p e r a t i o n b y t h e a n e s t h e t i c a n d b y f r e q u e n t v i t
r e a s s u a n c e a n d p e r s o n a l c o n t a c t p o s t o p e r a t i o n l y
N o t t h a t o f t h i s r e a s s u r a n c e a i d i n g t h e p a t i e n t
i n c u g h i n g b y h i d i n g h i s w o u n d w h i l e c o u g h
a n d a t t i m e s g i v i n g l e h a r p s l a p s o n t h e b a c k
T o r e f o r c e t h e p s y c h t h e r a p y a n d a c t u a l l y s t i m u
l a t e d e e p b r e a t h i n g c a b o n d i o x d a n d o x y g e n
h a l a t o n h a v e b e e n u s e d f e w t i m e s f o r a f e w d a y s

S u l f d a z e a n d s o d i u m b c a r b o n a t a r e u s e d
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t h e f r e q u e n t i m p o s s i b i l i t y o f d i f f e r e n t i n g i n f e c t i o n
f r o m t e l e a s t e a r l y i n t h e p r o c e s s a n d b e c a u s e
a t l e a s t a s f r e q u e n t l y f o u n d t o b e a s o c i a t e d i t h
f e c t i o n

C a t h e t e r a p i r a t o n r b o n c h o s c o p y i s a d v o c a t e d
i f c o n s e r v a t i v e m e a s u r e s f a i l

S P R I N G A Z I M A N M D

GYNECOLOGY

UTERUS

Hilberg S Re urr ne tn lrrad red Carcin ma
of the Ut ine Cervi (Study b r R d b e s
bestabl m Ca cin ma ll t) i s ad l
St kh 944 59

In rder t judg the n mber of ab olute c res
btained at th Rad iog cal Clin c in Lund only
the m t al for hch t atm nt as fin h d by
the end f 937 c uld b had d in th s study
Th mate al cons t d of 4 s ca es nd of th s
44 (3 4 p cent) r cu ed

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n 28 a d f these 8 patnts 90 t r d e loped a
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p r cent f th se recu rnces re local that they
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v g nae wh n first d t ct d Th uth r then at
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t me cr cto of the g nec l gal clin at Lund be
att mpt l ths meth d of f el m nary rradiati n
b the St ck h lm method and f llo ed t by hys
t rectomy a f w ls lat r P ofess r Westm n
lad d on the gud ng p eple that o ly tot l ex
t r p ti n f th uteru h uld b done the Werth m
operati n be ng res r d fo th ca s in which
ope able xtraut r m tastas are disc ed t
operati n

Ther fore during the per od f om 935 to 1939
inclus 5 women we e p rated upo by th s
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ated upon a ly thr ew eeks aft r ces t n f th
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cancer of th cerv

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ADNEXAL AND PERIUTERINE CONDITIONS

Mill tt J and Shell J M lgs Sy d m n a
Ca f f l llocul P d m clia Cy t
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3

I th l t f e rs r g tt t h a be
gl t th as at r f t b m o fib m om

GYNECOLOGY

UTERUS

H lth rg S R c ne In Ir d t ed C i ma
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b t hlt m C c m ll t) f i d i
St ckh 944 5 59

In d t j dg tl umt r l bsol t cu s
lt i el at th R l l gal C lnc in Lu d o ly
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Th materi le n t l f 45 c s a l of thes
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H v r v th g rd to th pr bl m f c rrence
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t m t n f l t r tment Ths r e t mat rial
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r d atio t eam t W th th ad ic a l en
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t r e t o v a f h l a t r l f e s or W t m n
l a d l n th guil g p n c j l t h t b to l e
t r p t n th t r ushould b do e the W th n
o p e at ion b ng r e s e r v d f th c a e s n h ch
o p e r a t i o n v t a u t e r n e m t s t a e s a r d e e r d t
p r a t i o n

Th r f d i g the per d f r m 935 to 939
incl 1 5 v men p e t d up by thus
m l i d m th d T the e m ght l dded p
t ent lo had underg e s dat t eam nt n
1932 but had o r e t u e d f o hys t e r c t o m y
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g e a t e l f u n c d n m s t n e a d
f i l t r a t f e a n i the p a m e t r l t u o o n
d e v a s f d i z e s O f th 8 p t t s p e r t e d
u p n l y th W t m m th d 3 d e l o p e d i t u l
a r e c t g n l t l f the d a m t f a l e a d
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g a l f s t l h c h h e a l d p t n u l a f t e
f o m n t h a d t h d e t g n l f t u l
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p e t e t a l s Th r e n t a n c e o f f i l l
b t e e n the b l d d n d a g n a m g t h e
n o t s b y e t t t the W t m p r t i n
N o t a c c f c s f u n d 9 f th 16 o g a n
x t i p t e d 5 t h e h a t a p p a d t b e v t l
c n c l l t l l t (n 4 f t h e t h

r s d l c a n c w a u c e d n the c r v i the
f i f t h t h c a n c e r c l l s e r e f u d p a m t l
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c a n c e r f t h e

O f t h 6 p a t i t s (75 l r c t) e s t l l f e e
f s y m p t m s f o m t h e t g h t y e a s f t e r t h e
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a l e a n l f o f s y m p t m f m f t h t y s
a f t e r h y t e c t m y t h n n t h l e l p d c a c u m
o f the u l a t h n d o e h l f y r s f t p
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y e a l a t e r g l l a r m t a s t a p p a r d n t h n
g u a l g o n a d p r g r d d p t e t l e r d
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r m i n g 3 f t h i p a t e n t s t l l f r e o f s y m p t m
f r e o f s y m p t o m s f r t h e y s a f t e r t h
p e a t n b u t t h e n d e c l o r d m e t t s i t h
t r a n s c l h h e u l d b e t r p t d T h u s
p a t t s s t i l l h a d f e e f s y m p t m s f
m o n t h s a f t t h e l t s g a l t r i e c n

O f t h 5 w m h o e m e d t o h a e t a l e s d u a
f c a n c e r i n the x t u r p t e d c r v l d e d a d
n e h a l f y e a l t t h t h i r d d e l p e d a h g
m t a s t i n t h s m a l l p l i s a d d e d f m u e m
l f o r e t o y a r s h a d e l p e d the f o r t h s t i l l e s
f r e o f s y m p t o m f r v r s f t t h p e a t n a n d
t h f f t h h a t o p a t h u b t h v t a l c a c i
p a m a t r a l g l d l t h u g h o n e w f u n d
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a f t e r the x t u r p t n a n d f r e f s y m p t m
The p a t i t h e r v c c o n t a n d w h t
s e m d t o b e d r a t a l 2 d c a n c r c l l d a m g d b
r a d i a t i o n r s t l l l n g n d f r e e f s y m p t m s
t h e e a d n h a l f a n d o e h a l f v r s
p e c t e l y f l o n g t h e e t r p a t i t h e i r t e n
O t h b a s o f t h r s l t s f h i s n e s t t u s
a d a d a t i t h e i n d c a t o n s i t t t v o
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s t h y o f t a l n d r m m d t h t n o r d t
g a b t t l t o f t h r e s u l t s i s l i v
v n g r o m e n t h f o m o i p t u o b p a t e d
o n a t r g s e l e J o h n W B R E N A N M D

ADNEXAL AND PERIUTERINE CONDITIONS

M i l l e t t J a n d S h i l J M i g S y n d o m f a
C a o f M u l t i f o c u l P s u d m c h n C y t a
d n m a o f t l O a r y 4 m J M S 945 09
37

I t h l t l v r s c a b i t t h b e r
g i c t the c t o f t h b m o f i b m m

11 fl l g r l l l d t t
r l r t () p p t l a t r l g l c l l
f d c s t a n t f e l g h t l i t l l t
p e n c l l n t h l y (2) t l e t t f f p t h l g a l
f r n r l t n t d g r e s p o a l (3) t h e d r
a t n f t h l a s c a t m j f f c t t h e s p o n s t
t h d g

S e t y f n a l e s a n d 4 n a l s t u d l
A l l c e p t 6 h a d f a l e d t o r s p o n d t o t w m r
C o r s e s o f s u l f a t h a o l s u l f a d z n F i e h d
r e v d n e c u r e o f a s u l f a m d A c u r s f
s l o n a m l i d s c b e d a s b e i g b t e e n o a d
48 g m

A l l p a t n t s c e h p t l l f l l w e d l
c a r f u l l y t h f q u n t c u l t l a m b a t n s
A p o s t t e s t f e s i a f t o r m e
c r s e s f u l f n m d e a j n t r p t d a s s u l f n a
m d f s t e s s T h e s e d r u g f a l r e e t h e n
i d e r l e a l l t e f p n c l l n t l r a p y

I n c u l l n s g e n t c u l a l y i n a c c f
t r l e l s t l l d a t e r s l i e s l u t c e r d g t o
c h d l e s t r u g g f m o o t 50 000 O x f d u t s
v r t h h o u r s f o a t t a l l o s g f f o m o o o o
t 00 000 O x f o r d u n i t

S e v n t y f u r r e s f p n c l l n w e r a d m n s
t e r d t 7 t f m a l p a t i t h e p r e s u m e l t o
h l f a m l t a t g o n h e a a d p r e s u m p
t v f a l c s t p e c l l r e s u l t d n 6 p c e n t

I t n o t d t h t t h f l r t e f r t h o s e w m e n
h a v g l o w r g n i t l t a c t i s e c t o n l y w a s m c h
l t h a n t h t o f c a s e s h a v g s s o a t e d u p p e r
g n t l t r a t f e c t n 35 p c e n t f t h e l t t e r
c a s f a l d t o e s p o n t p e n l l n A l o t h e l d r
t h i n f e c t t h e l e s s t h e c h n c e f c c e s t h p e
c l l n t h r

T h e a u t h r s i n f r f m t h e s r e s l t t h a t e a r l y
l a g n o s d e a r l y n s t i t u t i o n p e i c l l n t h a p
e p a a m a t c o n s i d t s i n t h c o t r o l f g
r h a I t h e f e m a l i n h o m l a g n a n l e c e

a l f f c l t t e t l l h l t c a u g l l
u l l v t l t l t h t h l l n m f
l u g m t h t h e j o s l l t f
H v l M D

S a n d r s J r f t i n f l c l g t h M b i d t y
n d M t l t y R a t e s i n G y n e c l o g i S r g e r y
B a d n A n a l y s i s f 500 C o n s e c u t i C a s e
i n P r i t P a t S t h M J 945 38)

F i e b l d c o n s c i t i v r c e t g y c l
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f m t h s t a n d p o t f m r b d t y a d c f a l t
a d h a b e n c m p a e l t h s m l e s o f
r o o o c a s s p o t d 035

T h e s e o l c s h a c a f a t a l t y r a t f
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8 p r c n t a l a o r t i f f i l t y r a t o f o p e
c e t f o r t h f m e r s l t l o s h a d e d
i d c e f m j r p s t j r t e o m p l c a t s
l t h g h t h e r t a l e l e c t n e r t r e t r n t h
c o d s e s s t h a n n t h f i r s t

P r e p a t e a n d p o t e r a t e c a c s b a c a l l
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r f u l l d y t a g a s t k f c t t h r a p e t
m p m e n t p a r t i c l a r l y t h e m l b e r a l s o f
t e f l d s a l i b l e b l o o d n d p l s m a
t r a n f a d t h e c l e d m f g e t e
o f i t t l d c m p r e s o T t h s e m p r
m n t s s e l l s t m c a e l l d m o e c n s t a n t
o b e r v t n t d e t e c t c m p l c t n t h e r p
i y c a b e a t t b t d t h i m p r e d r e l t i n t h s
s c d s

T h i g l e d e a t h n t h c d r e s o r d n s
a t t y s i x j e s i f e w h d d n t h e
o p e r a t i n g t a b l e d i t r a e o u s o d m p e t o t h l
a c t b s i a w h i p r m b l y a a d m i t t e d t
r p d l y S h e w a u d g i g d g n o t e v t h
f r m t r h g a i l t m i n e d g n
F o l l o w i n g

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Da J F and D ley D E A Critical Survey
of Diagnostic Pregnancy Tests C d U d
J 945 5 37

Although the number of pregnant women accepted for duty in the Royal Canadian Air Force is only between 5 and 8 per 1000 their elimination at the time of the initial physical examination would be desirable. Because the expenses involved in running routine Aschheim Zondek or Friedman tests would be too great for the results obtained the authors attempted to utilize the colostrum test and the histidine test on a specimen of urine to screen the pregnancies. A description of the procedure involved in the interpretation of the colostrum test and the analysis of the histidine test is included.

The colostrum was prepared according to the method originally described and the injections were made and the results interpreted by one individual.

Aschheim Zondek or Friedman tests were run on all men showing a positive reaction or a pseudopositive reaction. Histidine tests were run on these same individuals and on all a pelvic examination was made.

The results of the colostrum skin tests on 542 women are listed in Table I. The tests at the Women's College Hospital and at the Royal Canadian Air Force examining center were carried out by the authors. Forty-three per cent of nonpregnant women gave either a definite pregnancy or a weak pregnancy reaction by this test.

The results of the histidine test are shown in Table II. Of 106 nonpregnant women 12.4 per cent gave a positive pregnancy reaction and in 8 definite pregnant women a negative reaction was obtained.

The authors are of the opinion that neither of these tests is specific enough at least in their hands to be utilized in detecting isolated cases of pregnancy.

TABLE I—RESULTS OF THE COLOSTRUM TEST

Reactions	Urine Histidine		Women's College		3 RCAF (W.I.)	
	Negative	Positive	Negative	Positive	Number	Percentage
Positive (pregnancy)	00	98	4	6		
Positive (pregnancy) alone	3		8		3	
Total positive (pregnancy)	26	99	3	8	4	
Negative			6	8	2	8
		00	3	00	7	99
Positive (pregnancy) alone						
Positive (pregnancy) alone			6	3	7	3
Total positive (pregnancy)			6		3	4
Negative reactions	3	96.8		6		7
		00	6	00	5	99
Total	8		6		4	

TABLE II—RESULTS OF THE HISTIDINE TEST

	Non-pregnant		Pregnant		Total
	N	P	N	P	
Positive (pregnancy)			5	34	3
Weak positive (doubtful)			5		
Total positive reaction			3	24	
Negative			2		6
Total			00	0	00

am l rge gro ps f s pp edly nonpr g ut
omen J R K W also MD

Bigby M nd Jon s F A P gn ncy nd Dia
bet B J M J 945 1 36

The deq at use of nsul n has d cr a ed th
maternal r tal ty rat n th p ce of d b tes
but th f t l death rat r m high In 94
La re c a d O k l y h d a mat rnal m rt l ty f
per cent and a f t l d th rat of 37 per cent h t
h n o l y th 4 c mplet l v s p r v ed cas a
co d e red th latt r figu e falls to 23 per nt B H
and Posey (944) g v e a 7 p c t f l tal d th rat

In th s s es of 12 cases the n mat r n l
d ths but fetal deaths (7 p e nt) Th diab t c
r ks to th m ther ar k t o s s nd hyp glye m i
p r t larly in labor nd th e a l y p e r p r ium b t
i th c a f l m a g e m e n t t h e y c a n b m m d

I r e a s d l a b i l i t y t o e m i s s i d t b t h e
m s t m p o t a t r i s k n d a h i g h e d c e c d d
b y A m r n w t r s l l r i c k nd Tillman (938)
r p o t e d t o e m i a n 18 p e r c e t and W h t
H t (943) f i n d t h e c i d e e a h i g h a s 4 p e r
c e t i 19 p g a c e s L a r e n c a d O a k l e y
(1942) f o u n d t e m i n o l y p e r c e n t f t h 54
cases

D b t c s t e n d p r d c e f a t and postm tu m
f t L a l e n c a d O k l y (94) t h n k t h e y
r e a c h m a t r n i t y a t b t t h t y s n w e k s nd
t h a t f t h e y a r e n o t d l e r e d n t l t h e y e f t v
w l s o l d t h e a r e a l l y p o s t m t u r T h e l g e s e
(u p t o 12 h) m a y b e d t o t h x c s e a b o r p t n
f g a r r t t h i c e d p d u c t i o n f g r t h
h r m o n e b y t h p u t r y g a d T h e c i p o s
b l t y i s f o r d i t d o e s o t m p o i b l t c o
t r o l t h s i z e f t h b a b y b e t l l g t h d b t e s
T h e h e a v i e s t n f n t s b o r n t h m t h h s
d b e t e m d l l c n t r l e d b 30 u c o f
n l n d l y

P r e m a t d t h f t h f t u t e r m a y c c u
p a t u c u l a l y f t h p g j s a l l d t n t
t o t e r m d L a r e c a d O k l y m n t h t
f t h b a b f o p t e t h o r f f e t g t
l a b s p t l y e r e s t i l b o r n I t h i s s
p g n n c y m s c a r r d t t h e t t y t h d l t h
f e t u s h a n g b n d d f r o m t t t h r l l
b a b y d d t e r a t t h t h t h i d c e k T h
p a t i e t t h h s p t l a t g d i o w t h
t h d b t s t u s t r l n t o l l e d h n t h c h i l d
d d

H y d r a m s p a t u l l y l b l e t o o c c u and
a p r s t i n 5 c a s f t h e r N a t l d a t h
m y o c u l i m f t l h y p o g l y c m a c a u l b y o
d l p m e t f t h e p a t o u S u g a r
g p r p h y l a t e a l l y n t h s e c d t h c o m
p l c a t n f r t u t l y t u t e d F t l
a b n o m a l t a s d t b m f e q u n t t h a n
u s l b u t n e r f d t h s c a

T h p t n t s r g e f r m t 300 g m f
c a b h y d t n d e t s p p l y g b t 000 nd
500 c a l I t m p t a t t m t a a h g h
c a b h y d r a t e i n t a k e A t f r s t t h e y g t h

u s a l n s l n a r r a g m n t A s t h r n s l n e e
m n t s i c a s d f o r p e f r e n c e t h e y r e g i
s o f u b l i s l i n t h m o r n i n g a d a m r t u e f i n
p t a m m e and l b l i l n i t h e i n g I
v e r y d i f f i c u l t c a s e s i t m a y b a d i b e t u s
t h d j c t o f o l b l i l b f r l n c h

D u i n l a b r t h e s u l d t w a s g e a l n g a s
p s b l d t h n g l c o (r l t e l f m s t
g m a t t o h u r n t r a l and e x t 30 m t
t h o t f t h s o d s t g T h e m s c l a e t e t f
l a b o r e d e t h e s u l i q i e m t s a d t h
r e l d n g o f h y p g l y e m

A f t d e l i v e r y f s i j s d d a r u l a d
a t s l a c t o r y w r k g a r r i n g m e t t o g e h a l t h
u s l a m n t n t h f o l l v i g d y and b l d p t h
d o s i f n e c s a r y

I e m a t u d l e r y a t t h e t h i r t y s i t h r s e n t h
e l i a d b l b e c a u s f t h k o f f e t a l d t h
t e o n e a t r m a d b c a u s o f m c h a n c a l d i f f i c u l t i e s
d u e t o e r i a g e b s

C s r n e t h a b e w d l y a d v c a t j j
L a c s d O a k l e y s r t h e w e 7 c s a
e t n s w t h 2 s t i l l b r b b e s n d n t a l
d e a t h s m o t h e d d f m p l m r y m b l m

P m t u d e l i r y b t h e g a l i d u c t o f
l b o r w a s a d o c t e d b y B a d s t r u p d O k k b
(938) and t s f t h r t r l a e c m m e n d d b y
L a r e c a d O k l i t (94) w h b d d s a t e
f a t o r y a p e e n c n 3 p a t t T h m t h o d h a s
b e s d i t h p r s e t e r i e s w h l d e s
j n m g a d l l h r u p t u o f t h m e m b r a n e s w t h
t h e D S m y t h c a t h e t w a s p e r f m e d and
p t o c (5 t h u r l) m a y b e g e n i f d s a d
e e s r y L a b o r p t r t d w t h t d u d l a y
a l l b t p a t e t D l i e r y w s p o t e o u m
I t b u t p t e n t w h n d d a f c p d l r y f o
f t a l d s t e s

F t h e f r s t t t y f o u r h u r s a f t b r t h t h e
b b e g g l e s (t e p o o f l j p e e n t
a t e r e r y t h u r s) a t t m p t t p e e n t
h y p o h y m T h u s v a n r y t h r e e h o r s f r
t h t d a y t a d t h n f t e b e t f d
r g e x p d b r a t m l k a o n p o b l
D a t G M o r o M D

A b l A J F l t g r a l d J E F d a y l e d
R d o l p h L C a n m a f t l C e r v i x d
P e g n e x t m J O b l 945 49 3 7

F i g h t c a s e f c a m a t h t p p e a d d u r i n g
p g n y w e l l c a l l y s t d d m t h p a t f i
j a r s T h e e d t b t f t h c a s e s (6
c n t d i n y a r) l d r n d e u n t n b l a
s t a t u t c a l l a t f t h d c e t h e C o o k
C o u n t y H p t l r s s M y h t d e r o
p t n t s a r e u a l l y a d t p p a r s t h a t c a
c m f t h c r r t l s t d r n p r m a c y
m i g h t b m f q t h t o m l 7 p
t e t t h m l g n s t r a t t d q a m o s c e l l
e r c m a a d p a t t h d e d d l e d
t s a d o m

T h t d y t g a d c e n m a o f t h
r d g p e g n c v s s i m p r b a b l t h a t t u

causes of bleeding are given stubborn preceding in diagnosis and therapy. The malignancy is thus diagnosed more often toward the end of pregnancy when the growth has achieved large proportions. Caecoma of the cervix contrary to the opinion of several contributors continues to develop at a rapid pace during pregnancy. The earlier the diagnosis is established the sooner elective therapy may be instituted and the better is the ultimate prognosis.

The treatment of these cases depends upon the disposition of the pregnancy. In the first trimester the pregnancy is disregarded and deep x-ray therapy is instituted. With the death of the fetus radium is added to the treatment. In advanced pregnancy there is added caecotomy for the cervix. It should be spared the injuries that occur during parturition. If there is no infection as noted by the temperature or character of the vaginal discharge a classical cesarean section is performed to spare the cervix and to leave intact the fetal port of the uterus to facilitate the radium therapy. The x-ray is started after uterine involution has occurred. A total of 4,500 mgm hours of radium is given in the equally divided doses. As soon after the delivery of the baby as possible deep x-ray treatment is started and continued for a long period of time. In the presence of local infection as judged by the clinical examination of the perineal area a superficial x-ray is given as close to the cervix as an abscess may be deferred and from 500 to 3,000 mgm hours of radium may be given to the cervix. The progress of the cervical growth is monitored. The ultimate prognosis for the patient hinges on the persistence of the uterine infection. The deep x-ray of the cervix is instituted after the delivery of the fetus. The patient must be readied of the perineal area of the cervix and the cervix is irradiated. E. L. C. M. D.

LABOR AND ITS COMPLICATIONS

Johnson R. A. ACritical Analysis of Twentieth Century Perinatal Experience with Cesarean Section. Am J Obst. 1945 49 576

The author performed 36 cesarean sections as a result of 5,975 total deliveries. The incidence of cesarean section was 0.6 per cent.

A brief review of the management of cesarean section cases is given. The author's experience with the incidence of cesarean section in primiparae is calculated to obstetric cases was found to be 0.6 per cent. The incidence of high rate of cesarean section is noted.

Moody's diagram of the figure is noted by the author. The author's experience with those delivered by well recognized general surgeons and by general practitioners is noted. The author's experience with the incidence of cesarean section in primiparae is calculated to obstetric cases was found to be 0.6 per cent. The incidence of high rate of cesarean section is noted.

The author's experience with the incidence of cesarean section in primiparae is calculated to obstetric cases was found to be 0.6 per cent. The incidence of high rate of cesarean section is noted.

on for the procedure in the great majority of the 362 operations. Maternal and fetal mortality rates associated with each indication are tabulated. The survival rates are tabulated against the birth weight of the infants in the toxemia group and it is concluded that cesarean section is hardly justified in performing cesarean section in the interest of the child if it weighs less than 3 pounds but that there is a definite place for cesarean section in salvaging children from mothers with toxemia if the fetus weighs from 3 to 4 pounds or more.

The fetal mortality is also tabulated against the primary and secondary cesarean section and important conclusions are drawn. The gross fetal mortality for the current series was found to be 4.4 per cent and the corrected rate was 4.4 per cent.

Brief summaries of the maternal deaths are recorded. The gross maternal mortality rate in this series was 2.2 per cent while the corrected rate was 0.83 per cent. EDWARD L. COONEY, M.D.

Ullery J. C. Delivery of Quadruplets by Cesarean Section. J. Am. M. A. 1945 83

The incidence of quadruplets varies in different countries as discussed in the following statistical reports. Guzman in 1889 found them to occur once in 757,000 births in 189. Hill of South Germany suggested the following reminder rate as not less than 80 births triplets once in 80 x 80 (6,400) births and quadruplets once in 80 x 80 x 80 (512,000) births and Grawlich in 1930 studied more than 1,000,000 births from 21 countries and found quadruplets to occur once in 60,734 births.

The following case is reported because of the literature failure to recall any previous quadruplets which were born by cesarean section.

The patient as a thirty-year-old white woman who had had a cesarean section 2 years before this admission for abruptio placenta. The baby was stillborn. Her postpartum course was unremarkable with a temperature elevated between 104 and 106 degrees Fahrenheit for 4 days.

In the present pregnancy the last menstrual period was March 1944 with the expected date of confinement December 1944. During the first 4 months of the antepartum period she complained of constant nausea and vomiting so much so that in June she was hospitalized for 2 weeks for persistent nausea. She responded well and as discharged improved.

In August the uterus was found to be larger than normal for the duration of pregnancy. X-rays at this time revealed the presence of four fetuses. The patient was immediately hospitalized and remained so until 4 weeks after delivery. During this time the uterus enlarged rapidly until the termination of the pregnancy it was difficult for her to turn from side to side. She was given a high vitamin diet and postpartum (5 mgm every other day) plus vitamin D.

On October 4 the patient had some irregular uterine contractions and the uterus became quite

The reaf tal leath ram tal ty of 501 r
c it All of thes d tl cc rel pr r t d ly r
a l l 3 cases the f tus k i to ha e c l
b f dm si ftle m th to th ho pital Rup
ture fth ut s as the cau e f 3 fetal death and
abrupt o pl centa accounted for the fourth death in
this ser es

Shock as prese t in eac f these cas s of se ere
hemor hage a d m sit as profound The volume
of hemorrhage susta ed by these women was la ge
a d ften t mendus Large volumes of blood
bl l subst t tes or both were required to k ep
them out f dang ous shock and t carry them
through the hyst ectomy

Cas s such as these challenge the judge m t and
skull of th obstet ician a d test his capac ty t act
quickly nd effectiv ly Instances of uch sever
hem hage are rar in g neral obstetric p act c
ll ever in the small g up f cas s in which such
s vere h morrhages d occur rsk of de th f om x
angu at o e ce dingly gh Laparotomy and
rpa or removal f th terus is the first bst tr
t atment to b ppl d f rupt re of the uterus
for other typ s of f ctible bstet c hemorrhages
l parot my i na n a la t res rt but it should
n t be delayed t lo g

The purpose of the ar cl s not to urge the f
que tus of hysteri tom y the t eatment l ob
stetr c h morrh g hut t p int ut its important
pl ce the reductio of m tem l mortality f om
esa gu t ng hemorrh g when it and cated Th
perat n is ind cated hen the ut rus the site of
a sion pro ocat e f tr me dous hemorrhage th t
is not accessible for h m tas vaginally Hyst c
tomy s indiat d al o whe th usual method of
obstetric hem tas such a proper ute ne tamp
nad th ough the vagi a fil Onc th ind cat n
bas a sen the ope at on sh uld n t be delay l for
i m ny i ta ces such d ly pr v fat l

N rton J F A Mo tall ty Study of 187 D th fo
66 376 Ll e Birth A J O b t 945 49 554

O e hndred and ighty even mat nal de ths
a p e t d from a mat rty hosp t l h v g
thre parall ng services () a cl n c s rvic h ch
h s in close co ope at on antepa tum trap tum
and l postpartum s rv ces und th s per s n f
a ppo ted obstet c n () n ncl ic rv ce offe
g h p t l fac l ite for th mergent and oft
times f r the n tremis type f p t i t a d
(3) a pr ate ser c to hich any th cal phy c n
in th co nty may nd h privat pat nts

Fifty f of these 187 de ths ccu ing in 66,376
l briths h d suffi ci nt cl n cal a p cts to w a t
the be gl bel d p e utabl as f as the hosp t l
man g ment f th ca con e n d at f
8 p e 1000 l e b th

No ttempt wa m d t correct these 55 o to
f fferent at th ncl n c (m g ncy) or pr te
ca fr m th cl c cases f which the hosp t l w s
f l h r pons bl N co ct n as m de for po t
f artum readm s ons f r h m d l ies (x ept

ag n t i u s p e r i n f e c t u) n r a a n s t t l t r n s f r
f p a t i e n t f r m t h e r h o p i t a l s

The thert x e a group presented a r v l f
t c u l t p r o b l m i e s s n g the p r e v e n t a l i t y f n
t e r n a l m o t a l i t y W h t g o o d m g h t h a v e c o m f o m
th p e v e n t n o f p r e g n a n c y i n t h i s g r o u p t h e a u t h r
as u n a b l e t o s y E x p e r n c e i n d e a l i n g i t h t
r a s o n a b l y f a r a d v a n c e d p r e g n a n c y v r u n
s a t i s f a c t o r y

The g r e a t e s t e l m e n t o f p e e n t a b l i v n t h
t i r e g r o u p w a s r u p t u r e o f t h t e r u s h e m o r r h a g
p e r p e r a l i n f e c t n e c l a m p s i a n d h e a r t d i s e a s e

R u p t u r e f t h e u t e r u s p u e p e r a l i n f e c t i o n a n d
h e m o r r h a g c a n b e c o m b t e d o n l y b y i n c r e a s d
c l i n i c a l v i g l a n c e a n d f r t h i m p e m e n t s i n g e n e r a l
n d s p e c i a l t e c h n i q u e

S o m e h o p e f r a f u r t h e r e d u c t i o n n r h e m a t i c
h e a t d s e a s e a n d t h e l a m p s a g r o p s i s a n t i c p a t d
b y e a r l a n i l o g p r d o f a n t e p a t u m b d r s t
f o L C E L L M D

NEWBORN

S n f e d f i N n d S h m l g l s k y f P u r u l n t P a r o
t i f f i n t h N e w b o r n J P e d i S L o 945
26 49

P or to this port 57 case of purul nt pa otis s
i the n born had been recorded The authors e
port 5 addit onal case ob rv d d ing a p od f
hve v ars in t h p tals f llow g th d livery of
app ox mately 20000 infats du ng that pe od

The ga i m culured f om the pus in every cas
th epo tw s the staphylococcus aureus hem
lyticus which s th predom nat ng organ sm n the
nas y haryn of infants from o t three weeks old
a d is a p t ntial path ge Th re wer no co
stant etiological factors

Th e as first an unexpl n d rise i temperature
f om to 4 F from the fou th to the twelfth
day of l f commo ly at abo t e week of age
W h t n t y four h urs a swell g f th pa ot d
gl nd was n ted acc mpa ed by heat a d r d n s s
There was also a orexia and s me loss of we ght
The bl od showed a marked leucocyt s (fr m
8000 t 4000) the le cocyt aver g f om 65
to 80 p e t of th t al wh t e c l l e

After the treatm nt wh ch i outlin t the gland
rapidly increas d n s e a d becam f l c t u n t n
thr r f o d y s It then healed rapidly after n
c u s n d reco ry occurred in from o e to t
we ks In bout 35 to 50 per c nt of th reported
cas es th gl nd b eame n c t d during the cours
f f m t t three e ks The e were the oppos te
p r t d gland a d rous c r vical gla ds in all of
the th p mary o gam m was usually f und

A soon s th d gnosis w s mad by th presence
f the w l l g o v th par t d s l iathazol was
g e n b y m u t h g r j p o u n d i twenty four
h r s i f u r d s s Th was tolerated well l
th re we no reactions f any k n d As soo as
fluctuat n was ob rved in the gla d a small i c
ion was made at the lower h d j st ov th

an le of th m dible Apr be wa i serted and all
pus pocket e vacuated An i dof rm gue
drai s ert d tok pth wo d pen for lo ty
e ight h urs and a m t rm d ssng wa plac i
ve the r ll al g asp mpt a d th ere
ma n do ly a small sc that s mj r pt ble after
le m nths Th sullat ia l w s tnued as
l g s th e a a y dra nag or u t l th le c
yte c nt had f l l n m rkedly
I all f the l l r lit t re the pr gn is wa
g ven s bad i rt cul rly fo small bab s The
ve age mo tal ty a g e 50 j c t th no
m rtal ty i th r c f l A i MD

MISCELLANEOUS

G r r C D St lity th P t St tu of l
St dy nd M l od f Diag o l nd Tr t
m nt (l t l d d tad ct l d t d
m d de d h t y t t m e t) A l f
m d M 944 5

Whl ste lity s form ly th ght t be al ays
d e t me d f c t n th f m l t i no k own
th t t m v b d to ether mal r femal d fi
nc s dan qu ll ca fle m i ation m the
m l of both pa trs

Th m le exam t on sh uld ncl de n exam na
tion of the semen and th c l l e n t a d it It
ot suffe nt to ay that th re are ma mot le
pe mator a y mo cth nit ould b suffe tin
n ex m ti n f the blood t ay th t th e are
m ny de ll le nt mu t b tak f th stal
ty an l m th f the sp rm t a th pr s ce f
ny b o mal fo ms nd the c p c t v f the s m
f r liqu f c t i n p mator l e should b ca red
out to cl f d i n t ly a y g n h l f c t
nd bi p p c m e f m the t s t c l h l d b
ex m d The bas l m tab l m should l d te
m ned in men as l l s m t h a b e n
fo d that f t l ty lo i i l i d al ith lo
b l m tab l m The l l n t s sh o ld be m d

h h e n s i s t f the m c r s o p i c a m u n a t a f
seme take f o m th p s t e r i o r c u l d s c a n d d o
c e r v f o m and n h a l f to two h u r s a f t e
c t u

In the man car f l e t g e n x a m n a t
sh uld be mad f th wh le g e n t a l t a c t o d m
s t r t e a n y m a l f r m t i o t h a t m i g h t i n t e r f e r e t h
p n t a t o n o f t h s m n Th t u b e s m a y b o
c l o d e d o r t h e u t u s r e t o t e d Th K u r z k
M u l l e r t s t h l d b e m d e t o d t m n h t
the e n d o c e r v i c a l e c e t t i p e m e a b l y t h
s e m n A d p f t h s s c r t i o n a n d a d o p o f m n
a e p l a c d n a m e r o s c o p e l d e a t d s t a c e f
a h t 3 m m f o m e a c h o t h e r i r m l y t h s m
l l m o v t o a d t h e e n d o c e r v i c a l s e c r e t n a n d m u x
w t h i t A b p s y p c m n o f t h n d m e t r i m
sh l d b x a m i n d a d t h a m o n t o f t h v r i s
f m a l h r m o e s d e t r m n d The d e s q u a m t i n
f r m t h a g i n a s h u l d b e a m i n d a d t h e a g u a l
p l i d t e r m i d

The a t h r p o t s t h e x a m n t o n f 436 st r l e
p t i t s f r m V g u t 1943 t J l y 3 1944 t h
S p h l l o p i t a l o f M o H f o u d t h a t 3 p e r
c e t f t h e c a s e s o f s t i l i t y e r e d u t o b n r m a l
t i e s f t h e t b e s 9 s p e r c e t t a b r m a l t i e s
the m l 36 p e c t t o h r m a l f a t o r s t p e
c t t c o d t i o n s i n t h c e r v i s p e e n t o t r o
o f t h u t e r u a d p e r n t t o n u s
o t h e r c a u s e s T h e s e s t a t t e s a r v e r y i m l t o
t h e f n e t g t o r s i n o t h o n t r e s

Th a u t h o u c c d e d i n b g n b o u t p
n a c y n 44 c a s e s (10 p e r e n t) b t l y 3 f
t h e s e c a s e s n s t h e s l t b t a n e d b y s u g r y f
2 c a s e s t a s a c c m p l s h d b y p l t c p e t i
t h t b e s n d i n c a b y m y o m e t m T h e d e s i
t r a t m e n t f o r s t e r i l i t y i t h e f r t s g i c a l a d
t h e p e t c o f g e r y i n t h c d i t n b e
m c h a b s d T h e a t h u g e s t h t p c l e c t r s
b t a b l b e d f o r t h s t u d y f s t e r i l i t y a d t h t f e e
l e s b t a b l h d f r t h e d g t c l a s e s

A v e G M o A M D

GENITOURINARY SURGERY

ADRENAL KIDNEY AND URETER

Flock R H Th P ntive Tr atm nt of Cal
cium Urolith 1 The Import nt R le 1
Ea ly a d Frequ nt R ntgen graphic E m
In tion J U I Balt 945 53 4 7

Flocks analys ing 57 cases of calcium olith is
foll o g gra tu e of th spi e f ctur of the pelv s
an l t aumatic strictur f th ur thra st es th
mporta ce of f eq ent a d a ly x y cb ck up
e mun tions h ne r cond tions p ed po ing to
calc mu olith is are or ha e been p esent A tab
ulat on f cond tions pr di pos g to st nef ma n
1 giv M st important f th se ac rdng t
Flocks are hyp recalca a nary tas and
nary tr ct i lect n Wh n recumben 1 nec
essary by calc uri cannot b pr vnt d F
these ca es an o tline of t eatment s pre ted

1 The m int na ee f a large fl d tput
2 Cont of the d et—a h gh vitamin A and B ac d
a h d t d s rable

3 C nt l of st s s by m v ment of th pat nt
cathet dra ag te

4 C ntrol of n f et n

5 C nt nat on of t eatment for thr m ths
f ter mmob lizat on

6 Frequ entog og ph cexaminat n du ng
th all ss a d for ne year f t mmob lizat

W L L W Sc TR MD

B th A E Th B latt n hip f Epitheli i Budst
C rel ma f tle P l l of th Kidn y Ur t
and Bladde J U I B lt 945 53 45

This study e ns ts pr ma ly f m e pie
s a eh fo ell ne t in th u ters fr m 54 con cu
t e a t pses a d in a urg cal p cm f th
u na y t et i clud ng 4 p plary ca n m f th
r n l pel i 7 f the ur t ad of th blad
Epithel loell n t e coun l n 38 f th 54 a top
v ca s b t n n ca e s ny n plat c h ng
fo nd n s ocat w th u a tra t b d ll
nests In the su g cal p cm tss d t n a d
d jacent to the i m y ca n ma st led
Th scar as d l tap earm lig nt p th log cal
but m c e pically th y led about n s
hype em a withro nd cell f l t n n l ome d g
tat n f th epithel l cells int th p p t g
t su B d nd cell ests d nt l th th
e n in th aut psy ti u

Upon the mpt nt lat th m y be a lat n
h p betw n p th lal buds a l ca m r ent
g n th py w t d n 4 ca f in t ct
cancer 1 natt mpt nt ad r th s buds a ti o
u c p tble l a ca es of bl d j p pl m
t at d by oentg th apy nd tr n eth ald s c
cat n r cur uo h s notb n f d in tr t i
b y te ns rethral des cat n l n cur nos ha
be n b r d W L L W Scorr MD

I ge oft F M nd M lgs J V The Treatment
f Urete Inju d du lng Gynecol gic Opera
ti ns N E gl d J M 1945 3 335

Accidental i jury of a u eter 1 the most fr q ent
er s compl cation f gy ecol gic pelv c ope a
t n Sev u eteral i ries occur ed in 590 total
hyst r ctomies and ur t al i j ry occur d in 170
s p a y ginal hyst r ctomies d ring a fi year
per d at the Massachus tts Ge eral H sp tal Bos
t Thes 8 cases s rved to ill strate the type f
inju ies th t occur and the s rg cal princ ples and
pr ced es to be follo ed in rep m g them

Although each patient must b tr ated eco di g
to the circum ta ces in her case there ar certa n
m po t nt pr cipl s that sh uld be obse ed when
deah g ith th problem of the dam g d uret r
Fi st the imm d ate recognition of the injury is of
the tmost mportane This is true specilly ince
proper t eatment at the time of operatio may result
n a succes ful ana tomos s with hospitalizat n no
l ng r than that requ red for the outine uncom
pl cated pr ced r In th 8 cases re rved inj y
w s oted at th t me of ope ation 4 Th r e of
th s patie ts did w ll the fourth d veloped a
ur r v st la nd a pelv e abs s nd lat r came
t n phr ctomy Seco dly every eff t should be
mad t preserve th kid y function on th de of
th ju d r ter ntif the fu et n f the th de
ca be d term ned Palpation 1 ot an adequat
means of determin g enal f netion and the sacri
fice f a kid ey by ligati n o n phr ctomy ithout
kn l dge f the status of the rema i g kid ey is
u i l e se at n of the kil ey may be accom
pl h d by ephro t my skin u et ostomy o
t nspl ation of the eter 1 to the b wel or
bl dder The th d imp rtant princ ple s that all
u ete af an tomo s should be d n over an in
d ell g vl or rubb u ete al cathet The
cathete s rves a splund g th h al g of the
uret r ndal o acts t d compress the kid ey p lvis
p e t g dist nt on at the s te of th anastomosis
The ndwll ng cathet r has pro d tself to be the
most t l ngle fact n successful anastomosis
It sh uld r m in n place for s e or e ght days
aft op atio HARRY W F K M D

BLADDER, URETHRA AND PENIS

V nd n R E Operations f r Urin ry Contr i
of N urogenic Bladd s J U I B lt 945 53
565

Th ner e s pply f the bladder c mes ch fly
fr m t s urces The sympath c ners r ch th
blad r ch efly by way f the p es cal nerves b t
ome fb rs pass by way f the sac l n rves St m
lat n of the s mpath tic nerv s cau s cont a ti n
of the tr g mu cle Th p ra symph tic s
re ch the blad th o gh the s c l erves a l

treatment of nephrolithiasis in which the stones are composed of calcium phosphate or calcium magnesium ammonium phosphate.

The author presents data to show that natural estrogens by increasing the urinary citrate excretion reduce the concentration of calcium ions taking part in the precipitation of calcium phosphate and reduce the solubility of calcium citrate complex. The same effect cannot be obtained by the oral administration of sodium citrate because the result is a decrease in urinary citrate excretion. The administration of the sodium citrate without the reduced solubility of the calcium phosphate in the alkaline pH range and by an increase in urinary excretion of calcium. The study of the effect of the administration of calcium citrate without the reduced solubility of the calcium phosphate in the alkaline pH range and by an increase in urinary excretion of calcium.

Aluminum hydroxide gel by decreasing the phosphate excretion from the urinary to the intestinal tract reduces the amount of available phosphate participating in the reaction with calcium. Data presented show the relationship between the urinary excretion of phosphorus, calcium and citrate and the dampening of the dose.

Men given estrogen for the purpose of increasing libido and increasing sensitivity of the nipples. Men at times have decreased sensitivity of the nipples and of the genitalia.

In the author's conclusions states that the administration of calcium citrate permits the administration of the citrate without the precipitation of the citrate. The preliminary results are promising and the author concludes on this subject.

WILLIAM W. SCOTT, M.D.

W. R. A. A. Th. M. I. Clim. etc. etc. J. Am. Med. Assoc. 1945, 77.

This report presents a study of 54 male patients each of whom had one of the types of testicular hypofunction or atrophy which so can be the etiological factor in producing the hypogonadal climacteric syndrome. With the exception of men in the treatment of the female, the same for the two sexes.

The symptoms have been discussed so that the syndrome may be easily recognized.

Testosterone propionate given by intramuscular injection of 25 mgm three times a week has been found effective in relieving the symptom and in the production of sense of well-being. The patients which is the primary objective of this treatment. This medication should be administered for a period of 6 to 12 months. The patient may feel very well within a few weeks but it is best to continue beyond this time for the purpose of stabilization. Testosterone may also be given orally by injection and by implantation. The effective oral dosage is three to eight times greater than the intramuscular injection. In the action of testosterone is not so satisfactory. Implantation allows control of dosage.

Testosterone should not be given for the purpose of stimulating the sex. While it causes some patients to have sexual intercourse, it does not promise a definite result for older men if the phases of the reaction does not result.

It is important that the duration of the climacteric be determined since it varies in different individuals. Some are through it without much appreciable difficulty, some may have trouble for months to years and in others the period for permanent endocrine equilibrium may vary from one to five years. The latter group will need treatment for many years. The results of the treatment of the climacteric are discussed.

J. H. A. LOY, M.D.

SURGERY OF THE BONES JOINTS MUSCLES TENDONS

CONDITIONS OF THE BONES JOINTS MUSCLES TENDONS ETC

Col W H The Clinical Diagn I T atm nr
nd P g osl of Epiphys I Di turb n e In
Childhood J Am M A 1945 7 3 8

The t l gy of ep phy cal le n n t clearly
understo d nd it s imp s bl with ou pes t
ln l dg t l ly the e d tu bances exc pt on
an anatom c b s Th name o te chondros s has
be applied th Sta dard Nom elatur f Di
ca to mo t f the conditio n l ng growth
centers of h ch the t ology is b cu at least of
h hn n fed pin nas to th r c u et is and
our old and me f m lar tr ms m t b id
tracked f r p r p es f e l s f iat n and f f g f not
f oth re sons

Th pphises th ugho t the b dy ha e f
c urse a ery egular and consta t anat m e po
tion l th r osification: al constant fo any
particular cati n S me a very f sh e ters
al ly p es nt t t th while oth rs may r ma
c m pl tely east lag n us unt l puberty a d it i an
understand g f these f f rent pe ds f d elop-
ment h ch f r ms a has s for the recogn t on of n
r th l gal co f t n wh ch m y s p r v ne

In Legg l th s d a e some case c t nly ar
ne r by a d ct or a ds me may p esents ch
m r s m pt m th t hen n lat r l f a de fo me
h p s found beca e f d l p ng disab l ty no
h t r y f a l e t ou ble can be obta ed It is th
ns d ness fo n et b ch l gely e pon bl for
th del y n ap op r treatment n many ca s nd ot
eg l et on the part of th pare ts or the physica
l ghty f e per cent f all p tients ar males
Th y es en a y ng as thr ye rs f ge nd up
s t the te n lth ghan n t after t h years
i v r y ar The first y mptom n typical ca e s
ually l mp hich de l ps th d y ge on but
i ab e t f r rest and fr sng t ng up in them n
sng E minati ho s e early th d as
th t th is l m tation of th otat ns espec lly
i te nally d f d ct n The r entgen g m
will be th f n al id nc n ded t nsur the
da o

Th frst r q em t f therapy s that eght
bear ng b d e t ed As t is impos be to k ep
ll child en th th l n bed for th l ght of
t me need d t ll heal ng t tak pl e om
b t t t st be fo d for the id al Th r g
cal p r pl thas b f nd t b at i fact r v n th
r ga d and weight b nng th o ght b h p ca cer
t nly be cut t a min m m f the splint well f i t d
In the more acut cases th brace n read f be ng
f st ed t f r u l n the h e t nd d to a f
y cc patte belo th h e th the h e n the
n rm l d b l t pt qualz the l ngth of th two
l C mplet f i a t o of h f j t m pl t r of

I ar cy r nd cat d u les f p rpos f
t an p tation

The ge eral t eatm nt should cons st f those
measur s neces ary to k ep the child n go d h alth
anlth us of th thyro d gla d It has be clamed
that w th ea ly rec gn t ion of th cond t d
quate thy o d the apy will el m n t the ne es ty
for protecti treatment b t e f thyr d will
bu ry th heal ng p oc s nd th a th rs l m t d
e pe e c m k s h m f l th t t d s it is certa
thata o d n of w ght bear g es ent l b ut
the bone s f m eno gh to as ume ts f l l functi n
Th can b l ttle d ubt that a p act ally norm l
b p will result f th c ha b e seen ea ly nd
p oper prot ion has b en u d Those ho b
d t t ng nd bro den g f the cap tal ep phy at
the frst x m st n w ll p bably alway has m
d t t ion f the h p and a disab l ty wh ch alth g
negl g bl r bse t at frst w ll b ome gr at s
as the age increases E w th the p rrently perfect
reco eries the ll be tende cy to wa d th d el
opm t of d g n t i rthrit s i lat r l e

Sl pping f th pr m l f m oral p phys s occurs
about tw c as l t n b y a s g b a d m cl
to 70 per c t f the ca es the ge eral body bu l d u
th t h ch f eq ently desc b d as the F lch
type f i d v d al The smaller p r t nage of pa
tents a e app r tly phy call y n rm l h d re o
the tall a d th rap d ly gro g type

E am at n h th t m ty me e ter
nal r t at o th a de f n l m t i f m terna
r t i on and b d ct n When t th g h s f do
the t n l t tend to g nt e te nal rot t ion d
abdu t n but hyper tens n may be ev n frst
than the no mal s ide In lat r cases th r will be
ome sho ten ng of the ext m ty with ele t io of
th t ocha ter abo Nelat ns l e All f thre s
m ptoms and the cal h d ngs re d a t a grad al
stpp g nd otat n of the f m ral b d dow w d
and ba k and th eck

The lat r l r tge gram s b lute ly esse tal
f m t k es a not to be m de

Th pogn f n m l e n ar no m l h p
good o ly f th ca d d go d n th
e ly t ges th n d lay n n t t t ng p e tre t
m t Older c s l h ome disab l ty om
t m f a p no nc d d gr e

T e t n t n l add t n t th u e f th v o d
th cr epodu t med t co e to f th
d f e m ty and th p ent on f f u th sl pping
f te th ba b e m pl bed The th has
b e m therapeutically mo nd m cons r v t e
n the tre t m nt of the ca s In c e n wh ch
app mate d ct is obta n d by kel tal trac
ti and th m y tak e eral w e k s r m n r
th c es h ch th sl pping s y et m m n l
e th l ghter tr t n must b m nt d nt l th
j phy all cl es n t n f the h adm t l

a used by operative means. Multiple drilling of the bone graft, through drill holes, a large bone graft the Smith Petersen nail and vitallum screws have all been used for this purpose and each has its advocates. There is probably not much choice between them but it should never be forgotten that the operation of whatever type is only a means to an end and that end is union of the epiphyses to the neck. Until this is taken place, recurrent slipping may happen at any time.

If reduction cannot be obtained by traction, one must decide to manipulate the hip, perform a radical operation immediately or wait until fusion of the epiphyses has occurred in the deformed position and then resort to some type of osteotomy. The author has seen some excellent results from manipulation but many more poor ones with stiffness amounting almost to ankylosis and not infrequently aseptic necrosis of the head. The same is true of open reduction of the head and of wedge osteotomy of the neck, and he is therefore inclined to postpone radical treatment in these cases until a traction osteotomy can be performed. In the meantime, progress in fusion must be tipped by recumbency without traction or by the use of an efficient mechanical prosthesis. The osteotomy will ultimately correct the deformity and will obviolate the long rooff th interarticular pathological changes.

Disturbance of the epiphyses other than at the hip which emerges in the classification of osteochondroses are relatively unimportant. Once the diagnosis has been made, the treatment is always the same: rest, removal of the cause, and if necessary, surgery.

Vertical epiphysitis does not occur until puberty at the epiphyses of the long bones of the extremities. Most cases are seen between fourteen and twenty years of age and the smaller growths are more common. The lack of acute symptoms and the rounded curve of the distal epiphysis of the femur in tuberculosis of the pin. The roentgenogram makes the diagnosis clear. With treatment, the rounding of the epiphysis may be corrected in the end, but the deformity is the only symptom and as the spinal epiphyses may also be affected, the body is usually in the condition where can be progressed on up to this time. If necessary, and recognized, the patient should be treated at least can be protected and the symptoms allayed by recumbency, plaster of Paris brace, support and active muscular exercise to strengthen and straighten the back.

Osteochondroses of the tuberosity of the ilium (Osgood-Schlatter disease) is a fairly common condition in adolescent boys. It is usually a self-limiting condition and is usually treated by rest and support. The symptoms are best relieved by the pull in the plaster bandage and the patient may all be given many cases.

Apothysitis of the calcaneus at the distal end of the tibia in the Achilles tendon and the growths in the calcaneus are a hereditary condition. They must be removed at first. If they take place and then any residual disability.

Kochler's disease of Freiberg's infraction may require rest and protection to relieve the symptoms quickly and no disability results after the epiphyses has united. A full length steel in the sole of the shoe.

An anterior arch bar usually is sufficient treatment. The lesion in the tarsal navicular bone to which Koehler's name is given although similar with regard to pathological change treatment and prognosis is not of course in an epiphysis.

ROBERT P. MCGONER, M.D.

Dub H P. Aseptic Necrosis of the Epiphyses and Sh. Bone. J. Am. M. Ass. 945 73

A case of necrosis involving the epiphyses and also the primary centers of ossification in the femur. The bones have been described by different observers. Unfortunately in most instances the lesion has come to be known by the name of the original observer. This has the disadvantage of giving no hint as to the underlying pathological process and further of implying that in each instance we are dealing with an independent disease which bears no relation to the others in the series. These diseases have been known under more general headings such as epiphysitis, osteochondritis and subchondral necrosis. It is now generally accepted that they all represent the same underlying pathological process although there is no general agreement as to the exact etiological agent.

That some form of trauma with secondary vascular occlusion of the blood supply is responsible is held by many. Embolic occlusion has also been mentioned as a cause and endocrine dysfunction has been invoked by others.

TABLE I—ASEPTIC NECROSIS (PARTIAL LIST)

Primarily C. t. r.

Vertebral body (Cal 923)
Cephaloscapoid (P. se.)
Semilunar (K. back 9)
Pituitary (Kohl 908)
Astragal (M. h. t. 9)
Tarsal scaphoid (K. bl. 908)
Medioclavicular (B. schk 934)

Secondary C. t. r.

Vertebral epiphyses (Sch. et al. 9)
Sternal end of clavicle (Friedrich 94)
Humerus (Hass 9)
Capitulum humerus (P. 97)
Humerus (Brailford 935)
Ulna distal (B. m. 93)
Head of femur (M. la. re 197)
Iliac crest (B. chm 193)
P. b. ymphysis (V. Neck, 94)
Ischiopubic (Oldberg 94)
Iliac ilium (Legg 9)
Foot of Ilium (M. f. f. 9)
Iliac (S. d. La. sen 9)
Iliac (K. h. 90)
Iliac (Osgood-Schlatter 903)
O. calcis (Se. 9)
M. t. tarsals (Frederick 94)

The pathologic process probably is not actual death of the osseous nuclei followed by fragmentation on irregular absorption of the old bone and replacement by cancellous bone but rather on or calcification. This is the same process that has been been in adults in homoplastic centers. It is generally recognized in most tissues the cartilage is not involved in the process. In general the local findings are not prominent acute and the same be no complaint except slight pain and lumping. There may be reaction in the interstitial in the old part.

The twentieth century has been the greatest and the best of change, progress, and pictures. These changes by the methods of the present state the early silence of the leaf in the undergroundness and finally the signs of repair. In the earliest stages there are usually small areas of local development which increase in extent and intensity under the sun. The epiphytic becomes a full-fledged tree and finally an upright, with aggregated primary and secondary succession. The process may include both the epiphytic and the terrestrial, although the former may be improved in its situation. In the light of recognition, recovery, and a gradual increase in position, the plants finally become an epiphytic. This is finally a final arrangement of the new conditions of recalcitrance, utilization, and the restoration.

The am nt f defo mity f th rest r d bo v
contour lld pend on m n f ctors cluding the
stage t wch d first rec gn d a d adequate
tr tment ppl d Th l ration of t eatm nt al o
plays rol Some pati nts r fuse to ll w the
n ol ed part adequat rest aft rth mptom ha e
d appea d It shoul l e rec gn d that ther is a
definite l g b n r pl c m nt s c m p l ith
th d ppea nce f the mpt m Ma p ti nts
h ad i t n e f ll be ng t a tim h n the
ro tgen gam stll sho nec o a l v ltle
e dence fr gen at

R M P M -TCOME M D

Lewl L G Ca s f Se r Pel l Injury A
S 945 47

Four cases of extensive injury from the
armed forces represented. It is believed that
when doubt exists as to whether ruptures of the
bladder, urethra and uterus it is best to drain
directly through the immediate. The procedure
is easily done in the mobility.

hemostasis r w a nls may b aser us
problem the par f d f ct d lle at the
time of int l s g r y t hlral g w b m m
mum scar fo mat n lfe rly pa impr ct c l
then uffic time h l d b all u d f the s b
dence of nfection h alng s r co tract nd fr
rehabilit of the p t nt b f c r ectu e
re r v s ca led out

intrapelvic abscess complicated by rupture of the bladder and

membranous urethra excellent results were brought out when repair of the defect was carried out at the time of the initial surgery.

RICH J BEETH I MD

**SURGERY OF THE BONES JOINTS
MUSCLES TENDONS ETC**

Wenger H L Tran pl ntati n f th Epiphy cal
Cartil g A k S g 045 5 48

Th p o m a l p p h e l c a t i l a g e f o m a f i b l a
c n t a n g a p o r t i o i d a p h y s s s c o e s f u l
t r a n p l a n t e d t h e f i r s t m e t a t a r s a l b o n e h r e n e d
b y o s t e m y l i t T h e t e h c h w a s g r e a t l y s h r t
d p o r t o t h o p e r a t i o n w a s i m m d i a l y
r e c t e d b y t h e t a n s p l n t O b e r v a t i o n s m a d e
a p p r m a t l y t h c e y e a s h t h a t t h t a n s p l t
h s t a k n h d f n e t o n n g p h y l g e a l l y
m t a r s a l b o n e n t h f o o t h c h w s o p e r t d a
i f x c t l t h e s a m e a s t h e c r r s p o n d i g b
i n t h p o s s i t f o o t T h p r m p l t a n o f t
e p h y s s p p a r s t h a f d w t h t h c u i f m
b o e w t h u m p n i n g t h g o w t h o f b o n w h
t a k e s o f c e m o r e d s t a l l y

The virtual life of the transplant can't be predicted at the time, but the extremely gradual growth rate obtained to date gives rise to the possibility of

RO ER P M TOME MD

Str ub L R Th m n T C nd Wil o P D
The R ults of Epiphy eod nd Femora
Shot t i gln R l t t Eq lizati n f Limb
Lengths J B S z 945 7 4

The authors have listed the results in 80 cases in which pharyngeal disease was performed and in 50 cases in which laryngeal disease was performed.

showed that in some cases of phylogenetic analysis, the use of a single character to define a group can lead to a misleading conclusion. The authors suggest that a more comprehensive analysis, taking into account multiple characters, is necessary to accurately define a group.

found in 7 percent of the cases.

In the 9 cases of femoral shortening the average correction obtained was 4.7 cm (18.9 cm). There were no intraoperative fatalities or mortalities. Complications occurred in 3 cases.

the s n i c t n d n a n f y hematoma
O the b f th es its the a thors concl d
that the p blem of lmb equ l at n m t be du
dual z d nd th t pa ticular rule p oced

fund the t pph odes s lth gh pp entl a
mpl p ocedu i re rs ble nd pres s the
d nger f gr th d f m ty Th p t is f
the in p o r p o t p h b e a candl

er a ng di er p ney and a c n d rable d f f see
n t m b l g t h H e a n t h g t l e m
g u l d t e l d n h f n b o l t l c a n b
c e m p l h d b t h s p d

Th utl r tuly cl l's meas r m nts mal
54 a lult lu n fem r ele ted tr ndom fom
dr el n t m cal l b ratory spec m ns Of th
number 48 had a single nut ent ca al hile 6 v e e
l c red to po t o s ch c nals T o f mora
f om the ne born e secu ed nd ident cal tudies
made on th m

In mak ng the me surement of th f mora t v s
d ed that m re e et data could b secured by
mak g o tg p am l the bo sand mea ur ng
them Th p oclur e as ca red ut by frst
passing a small n dl al g th n tre t can l nd
th mo nt ng the b ne n e tt v th clay so
th t roentg n g ms c uld be made In each ca e
the rays l l p to the c nal at a ight angle

R gul lta p eel flm as used in making the
tg ok am l p r s wer made at 7 inches
th 75 peak k lov lrs nd 2 m ll amperes f r
fifteen c ond

In det m ng th l c ti f the met phys s it
a n t d that afte cl sure of th ep physis s it
abl ari t n nd ty d l not l ys appea t
rev l the ite of clos r T o p cum ns in th
gro j rev led ep phy al l nes h ch wer n ath
obliter t d f m these po t were f nd which
ere p es nt in ll f th pe m nd hich
showed def itely the plan h r the met phys s
a d p phys f sed

It th n became pos bl t measur th o all
length of the l ft a lth d ta ce b t een D gby
te of in ti l feat n lth d tal and p ox
male l f the h ft

The tho c nclures th t the D gby m th d of
l t min g perc ntage f gr th fr m g en
p ph l l e in a lo gb c (l) c mpa ing th d
aphy al length with the d st ne f m the metaph
v is to the ters et i n f the nutr nt rt v a d
the cent f the m l l f ca t) n r lable and
th ut so n lat n Th figu es d r d by the u e
of this meth l i est mat ng the perc ntage f
gro th fr m a g ep phy l l e a e m ccu at
Ro r P Mo r cox M D

Hatt em R G Th T tm e f Arthritis
P in l l D m r l n N Synthetic A l g l
A f f M 945 383

Dem r l appr a he the p te cy of m rphi but
th ad f ti l b lty mu hle s tha s y op ate

d n t Fu th rm e l m r l has b cn a l m
ste ed fo m ny ks mo ths th ut crease
s the do g t a hiev the same alg s c flect
Du i g th pa t four years 83 h pital ed pa
t ents nd 73 amb latory patie ts we t eat d w th
deme l All f these patie ts cr uff n from
e r p t associ ted th a arthr ti co d to
Eighty n p t nt r c d 92 tr als of dem l
pa e r lly nd patie ts r c d 13 tral
orally Both methods e u ed i th treatm t of
28 patie ts

Pa t r ally adm t ed d m r l resulted i
sati f ctory a lges 83 pe cent of th tral
a d f rther 3 p cent of th pat ts ce d
mod rat r l f f p Th adm istrato f r o
mgm p r rterally cry f ur h s was f c t t
cont of the pa f thr m ho rs n th m aj r
ity of the pat nt f s o nt ard re c t
wer n ted Th same r ult was ach e d a l g
as th m dicati w s g en t gula nter ls
Exc ll nt r sults we obtan d in l evi the pa
of th e t c d m ga dle f ca sat n
Sat fact ry r ults e al o b r y d i pat ts
uff r g f m mv t cute b rs t ad a ced
osteoarthr t nd heumat id g coecal a d
pe fic inf e t s rthr it Complet ly sat l c t r y
results wer obt i d n 6 p ce t f th 3 trals
wh d me l as g n rally Th c d ito of
th mb lat ry pat nt was complicated by th
f ct that a high p tag per nc d d z z n e s
u m t g a d r ly s y n c p e D f 73 m
bulatory p t nts g d d ot obtan r l fl m p a
S m f these ns t f c t r y es lts m y ha r e b e n
d e to th fact th t the m d e t on was not con
t n ed accurat ly th d sag was n t f m ent
T lera ce t th a d e e t usually de l p s
Q te rap d ly This llo s the a lges c f f c t s
tak plac

It is recommended wh n t rting th
dem of f ambulatory p t t t start with
small d se usually 5 mgm for the first few d
u til th tende cy to r ct ns b des As soo
a poss bl th d g sh ld b i c ed t s
100 mgm very f r h urs Th egm in an bl
g ve t f c t r y r sults reg dles of th type f
a thr t or the e ty f the pa Dem of a
g v sympt m t e rel f of p in nly

R CHARD J BECKETT J M D

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Shinker J M V sothrombosis f the Central Nervous Sy t m A Character i t l v cula Syn d m Caused by a P l i n g e d St t f v a paraly i l h v P j h t Ch 945 53

Vas paraly s s nd vas th ombo s of the ce t l nerv u sy tem are d cu sel i th s art cl nd 2 cases ith ev de ce of prog essive d so der f th nervous system on a va cular ba a repo ted Aut ps son these 2 p tients ealed b th va cula l s ns and cha g in n rve tissue p m r

The ascul les s consisted of ma mal dilata tion a d co gesti f the cap ll ries a d small They cre e g d and sh wed all the cha acter tics of vasop ralysis Ther w als om deg e active h nge i the walls of th smaller blood es is ad an g eve to the pont f o mplet necros th creased permeab lity f eous fl d and ed blood cell There w also m nife t t of ealy thrombosis and th lum of s m of th small em e c mpletely occlud d with bl od clots composed of c vel st an l s f s b r m l with la gema es l plat l s a d white bf l cells In these cases the ves el walls eemed to be w ll pres rve l xcept for slight lo of t nabl ty of the cellula elem nts

The cha ges otel n r ti e c s der d econdary t the e culat y cha g a f ns t d ghely f w dly d em ated r as f l t g volv g the cortical bbo nd th ht ub stance Th e v e c o c s l sm l l d m t d foci in the white matte

The uthor consider that th e ch g s as par ly i and va othr mbo (h h a l i st g ol the proc) sult from a sl gup f th creb al circulat n in e ntra t t th ct l g cal fact rs in th ombo of a ter l t bel ved that a y change n the v sel l is sa v i it a n g factor of th ombo s of the mall n

Mech c l fa tors in the blood t am f r g slowi gup f c cul t r sult ac mulat l r d blood cells nd plat lets th th lual p o d ct n l a th mb s Th tat l a p aly a oot t d ith xtr m dlatat n f th small r ve s is the pr curs r of uch sta d l l l f by v cul r occl s n H B ~ MD

BLOOD TRANSFUSION

Ba k r W Crom r H E H rn M nd Wugh J M The U of Dicum rol n th Pre v tion t P toperati Th mbol a d Emboli m with Spec I R f re ce t Dosag nd S fe Adm l t trat n S gery 945 7 7

Th report is b s l n bs rvato f oo r cal pat nts h r g d ma l l s v

m thyl neb s—(4 bydro ycoumarin)] i their im mediate postoperative p od for the purpose of pre v t n g venous thrombos s and pulm nary embolism The authors have found this drug effecti e in the p event n of these complications in p tient

ho hav had nonfatal pulmo ary embolism throni bophlebitis a history of f revous thrombos s or embol sm and when this drug was g ven prophylac ticall no th ombos s or embolism occurred Dicu marol should not be used nless daily and consist ently comparable pr th omb n time t sts are made since without these it s impossible to be certai wheth r insufficient adequat ore cessi e and poss ibly da gerous amounts have been giv n The authors bel eve that only the Q ick prothr mb n t me test should be us d for these determinat ons Cons stently comparable pr thrombin time tests de pend on the use of th omboplastins f constant p tency r on the checki g of each ne v b tcb of thromboplast n with various dilutions of normal plasm It may be preferable from the atandpoint of the cl nic an or surg on v ho i supervis g the dmi strat on of d cumarol that the r ports be g n in percent ge of normal pr thrombi rather th n i seco ds

The p tence of the a thors i the ooo ca es in wh ch dicu r l va us f has b n that with th th omb plast c s stance wh ch as us d th omb sso mbolism lm t c rtai ly d l not d cl p i f the po th ombi time a gr ter than t nty s ve eco ds the time wh ch e r spo del t that of 30 per cent norm l plasm a d that def te bleed ng d d not oc r i f th p thr mb time as less th xty s and the tim hich cor espo ded t that of o per nt n rmal pl sma The authors ha adopted b t a lly th t y f v nds th tum f 20 per ce t n m l pl sma s th k y po t f l e e l g about th d age

De ma o l s eff ctiv when adm i t clorally The a thors h v e lea r d t smplfy th plan of adm i stratio s far as p ss bl in rd r to keep th p o th ombin le l betwe n 30 p cent and 20 per cent of norm l f r ch i d i d l patient and th y recommend th foll i g pla of d age

The ent re amo nt of the drug f r ach day is g en a i gle lose Th e hundred milligram are g en the first d y nd 200 mgm the s co d day f w hund ed m lligrams r g i en on each succeed ng day th t th p othr mb n is gr ate th 2 per ce t of n r m l If it is l s s than 2 p r cent f orm l no d cumarol is g i n on that day

It m t b e r mphas ed that d finite proth om bi def c ncy d e not d vel p immed iately aft r the drug has be n g en F f ct e le els re n t eached u l alter f om twenty f ur to lo y-eight h rs and somet me a c ns derably l ger tim

If b caus of hem rh ge r b ormal ly high p th m h t mes t deemed adv bl t lo er

th p oth ombin time ths usually can be accom
pl h d by th tra slus on f 500 cc of fsh c trated
blood It may be n c s a r y t tra slus bl od sev
e l t m s o r a p r o d o f t h e d y s s i n c e
the e a t n d e c y f o r t h p r t h r m n t i m e t o
n e c a s e a g a i a f t r f r o m t v o t s x h u r s h a e
e l p d

I t h e c u r s f t h s t l y m a d o n e b u l f t
u a l l y i a s g l e d o f 64 m g m s l m t r d
n t r a n o u s l y t o 37 p a t a n g h o m
e e s e l f e n c y f p a t h o m b n h a d d e l o p e d
f t e r t h a d m i t r a t n f l e u m a r l A l l b u t
p a t n t c p n d d s a t f a c t o r i l y T h e a c t u l r i s k
f b l e d a t s m a l l a m n g p o s t o p e a t y p a t i n t
r c i n g d i c m r l i f t h m e t h d f l l a g a n d
c o t r l m n t i o n e d p e i o u l y i s f o l l o d I t p a
t i l a l y s m a l l a m o n g p a t n t s h o h a v h l s m
t h o m b t e r m b l e f 1001

B y t o M H a n d T y l E S C o m p l i c a t i o
A r t i g l n D o n r s t n V i a f B l o o d f o c u e
m n t l j e c t i J M d e 945 09 4

A t u d y o f 4 0 0 0 j n o s h a d c l o s j t h a t
a e n t r o l l d b f p e r a t i o n f r l l j o d u c s
a n l a r g d e l b i t y t a n d a r d f a l l i n t r s t h
i t h d a l o f 5 0 0 c c f l l d f r m n m l h e l t h y
i d u a l o f f s n e r u p o t n t i a f h d

A p p a t e l 10 p e r c e n t f t h d n r s h a e
p e r e n d t n n t d e m f o t n t h r m f r m
h e h t h e b l o o d s w i t h a n d a l u t 9 p e r
e t h a e h a d s o m e f r m o f t r a n t r a c t a n d r
i n g i m m e d t e l y a f t t h e d o n t n T h i n t a n c s
f l l a c i r e t i o n f a v e p e o m h u r s a f t t h
l n t i n r e r a r e

T h e a d o v a c u l c o m p l i c a t i o n s f r i d e e
f r t h n t h n m a l c o p t a c y f r c e d n t s f
t h s n a t u r e n d r d t h n t d c l r l a t d
t t h t h d a l f b l j A p p o m a t e l y 4 p
n t f t h d n s p e n e d p l o g d o f t
m a n f t a t i t h b f h i e h m a y h b e a
d l a y d g n a t n f t h m g l b n O n l y a r y
s m l l b o j d l p d j m y t o m f o r w h c h t r
n j l a n t p h c a l b

W A T E H N A D U M D

D G o i n E L l i m m n i t y i t R h F a t r
C f B l o o d T r n f s i n R a c t i n J
L b C l M 945 3 97

T h e a u t h o p s e t s h t h t o r y f t h e o k
d o n a n t u d i e f t h g g l t u n f a c t d e g r e d
b y t h e t l R h a d n t s t h t o m d d l
w h o b l o d R h n e g a t w o u l d s e m t p s s
t h e p o t e t i a l t y f d e l p n g a n t i R h g g l u t
b y e t h e r o f t o m e h a m b y c i g b l o d
r e p e a t d t r n s f s i s f m R h p t e d r b y
l a r g c h i l d e n h s b l d R h p t c
j p m t h y 15 p c t f p r n o f t h h t
r a c e n t h e l n t d t a t h b l o d h h R h
n g a t i t m i g h t b o i l d t h a t t h d e l p
m t o f i s e m n t t t h l h f i t u l d b e a
c o m m n t h e e n o t h g h t h r f t h t
m e c h n a t l y a l t h h t m b n t

f t h e R h p o i t c h i l d a n d t h e R h e g a t i v m o t h r
o c c u r s i a b o u t i f i p r e g n c e n l y i p g
n a c y n 4 0 0 r e u l t s n h m o l y t i c d e s o f t h e c h i l d
I t h a s a l b e n n o t e d t h a t n o t a l l R h n g a t i v
c p i n t s a r e m m u n i z e d b y r e p e t e d t r a n f s s f
R h p i t s e b l o o d

I t p a r t i c u l a r l y d s r a b l e t o o b t a n s o m p r
p e c t i c o n t h i c d n e f o m m u n i t y i n a g r a l
t r a n s f u s o n s e r v i b e c a s t h p r t o f o f t n s
f s i o n r a c t i s d u e t o t h e a n t R h a g g l u t
q u e r e s p e c a l l a b o r a t o r y t s t a p l i m a r y t r a n s
f u s o T h e m i l i t a r y e m p l o y m n t f m l t p l t r a n
f u s o s o f g o p d o r s o r r e c i p i t s o f a y b l o o d
g r u p w i t h u t p e l m n r y c r o s m a t c h a l s o r e s
t h q u e s t i o o f p o b l m o r t a l t y f m i o m m u n i z a
t i n t o t h e R h i c t o

T h e a u t h r c u s e s t h e m e t h o d s f t h i n e t r a
t i o n t h a t h a v e l d t t h e r e p o r t h e w t h p r e s e n t e d
T h e i n d e n c e o f e a c t o n s i s n o t e d a n d c l a s s i
A s e r i e s o f 5386 c n c u s b l o o d t r a f u s
t u d i d O f t h e s e 5 2 0 0 t r a f s i o n s w r e g i
t r a t r a c t i o n T h e s e r 86 (54 p r t)
t r a n s f u s s i t h r a c t s f l l t y p e O f t h e s
r e c t i o n 101 (8 p n t) w r f t h e c h i l l a d
f e r e t y p e O f t h e t o t l c t i n s o f a l l t y p e s o l y
6 c o u l d b t t b u t e d t o s m m u n i t y t h e R h
g l u t g n a n n i d e c f l i p e e n t c
i t a t t t h e R h f e t o a s t r i b t d t o m l p l
t r a n s f u s o t 41 s t a n e s p r e g n a n c e s w e e s p o
s i b l n t h o t h T h e r e s i f f a l t y

T h e a u t h r p r s n t s i n d e t a i l t h e h t o n f
t h p a t e t s s h o i g o m m u n i t y t o t h e R h f a c t
a n d c u s t h e l c a l m a i f t a t o n s i f a
f u o n r a t i s d u t o m m i t T h d i f f i c u l t i e s
i t e t i g f o R h i n o m p t b l t s e p r e s e t d n o
l c u s d
I n c o l u i t s t d t h a t a s r e s l 5386
e c c u t e b l o d t r a f u s n s s t u d e d M u l
t p l t r a n f u s e g e n t r e c p e n t s w t h o u
g a r d t R h t y p e r t o b s t t r e h i s t r y f e m a l
r c i p e t s T r a n f i a c t s o f l l t y p e e r e
s t u d d f e d c e o f s o m m u n i z a t i o n t o t h e R h
f a c t r T h e n d n e e f t r a n f i n r c t s o l a l
t y p e s i n t h s r e s w a 34 (0 p r t) I n 33
t r a f u s n g e t o 2 m a l e s t h i d e c f
r e t o n s a s 3 (p c n t) I o o f f e m l r e
c i p i n t f a l l a g t h i n c i d n e o f r a t i n w a
39 (4 p c t) 54 t r a n f s s T h e
s i d e r d t b a s t t c a l l s g n i f i c a t d i f f e n c e
t h e s h c h m y p s b l y b e x p l a n d b y s o m
m e m s t y t h e R h l e t o r d l o p d d u n g p r e s
a c y

I n t h e 86 t r a f s i o n e c t n f a l l t y p e r l y
6 e e l o u d h c b c u l d b e a t t r b t d t o s o m
m n t y t h R h f c t a r i c d n e f p e r c e t
n t h 5386 t r a n f u s n s l m m t y w t b
t d t o m u l t p l e t n f n n 241 t c e s a n d t
p r g n a n c y 2 T h e e s i f f a l t i v f m t r a
f s n i R h p o t b l o d t a c p t b o h d
h e n s n t 2 d b y m u l t i p l t a l o s
T h r r e 77 p t e i n g f o m t 3
t l u s I t h s g p a s s u f f i c t l

se utilized to the Rh factor to give clinically significant reactions. It is estimated that of the 399 recipients receiving 4 or more transfusions approximately 6 were Rh negative. Only 4 or 6.6 per cent of the ewer immunized to the Rh factor by multiple blood transfusions.

The case histories of the 6 recipients with isoimmune reactions are reported. Preliminary cross matching for the anti Rh agglutinin would have predicted all of the reactions. A series of minor agglutination reactions in a recipient cannot be depended upon as adequate ruling of development of sensitivity to the Rh factor.

H L R I T C S T O M D

Self E B Thalhim W nd Sc dde J Pooled Human Serum A S 1945 2 338

The authors present a report on the administration of 199 units of human serum to 36 patients. They note that the clinical signs of opion addiction are to be that serum equally as effective as plasma although associated with a higher incidence of reactions. The quantity of serum administered at a single injection by the authors varied from 50 cc to 100 cc. The total amount given in every case was 199 units. The average dose of serum per case was 550 cc.

The authors describe in detail the 36 cases which were treated for shock due to lethal trauma shock due to hemorrhage operative and postoperative shock of the treatment of hemorrhage and hypoproteinemia and of peritonitis. The incidence of reaction was 75 per cent for 244 transfusions. There was little difference between the cases treated for the shock and those which died prior to treatment.

The following details are given by the authors from the study of fresh liquid serum given to 36 patients. (1) Fresh liquid serum given to patients with hemorrhage and hypoproteinemia on a daily basis (2) liquid serum given to patients with hemorrhage and hypoproteinemia on a daily basis (3) fresh liquid serum given to patients with hemorrhage and hypoproteinemia on a daily basis (4) fresh liquid serum given to patients with hemorrhage and hypoproteinemia on a daily basis.

ping of the serum transfusion immediately supportive therapy included which occurred during administration of the concentrated liquid serum.

In this series no fatality was attributed to the giving of serum. Reactions practically never occurred in patients being treated for shock. The total reaction rate including the fresh serum the concentrated liquid and the whole blood serum was 46 per cent.

The authors emphasize that they believe both plasma and serum have a place in the treatment of patients. From their experience plasma and serum are equally efficacious clinically. They can be used interchangeably without noticeable difference. Each possesses certain advantages which the other does not possess as follows:

(1) Plasma () there is a lower incidence of reactions (2) the ease of storage (3) plasma contains fibrinogen and prothrombin and (4) it is more easily prepared as a by-product of blood banking.

In serum () the ease of preparation and products contain 7 gm per cent as compared to 5 gm per cent for plasma () the ease of storage and trouble of treatment (3) serum can be filtered more easily (4) sterility can be assured (5) liquid serum remains clear while plasma (unless carefully prepared) is turbid and (6) serum is more readily stored without the presence of clots.

In conclusion the authors state that pooled human serum is an effective blood substitute. Serum administration is associated with a definite incidence of reaction great enough to justify plasma. In the experience of the authors serum prepared and injected in twenty-four hours after the withdrawal of the blood gave a better result and fewer reactions in each case. Serum is now being prepared at the Princeton Hospital. Blood banking methods and procedures have been developed by the authors. Patients with low plasma protein and low calcium have been replaced with serum rather than with citrated plasma theoretically as after such treatment the plasma protein is restored. The reaction caused by the serum plasma is rarely severe. The choice between the two comes largely a question of convenience as well as practicality of preparation and administration.

H L R I T C S T O M D

SURGICAL TECHNIQUE

WAR SURGERY

lea ll B S Aut ll at Fl e fl w g
Bl t injury W W d Ct 945 7 6

In 3 ca es appar nt co g tiv h at faidur f l
l w g blast i jury v s b rv d n p t nt v th
pe iou ly no mal hart Thirty f e th r pa
tients with bl st injury were stud ed f m a car
l vascul r vie poi t T o of th se bad abno mal
v spr ss res th t h v usc use an f g add
tional pati nts ma f t d def it electr ca l
graphic ab orm l ties

Whe as at the pres nt tim n l quate e pl na
ti n can b off r d for th e b rvati s the pr b
lem i orthy of furth rstu ly snc it uggest that
he pulmon ry ed ma de el l f llo ing bl st n
l y l g tal at on nd ne ect n may b i di
c ted J v J Mayo tv M D

Dek I L Ti Ma gem nt of M Itipl I Juri
In Atre w L d b gh W J 945 5 61

In an a tie l ing with re w ca ltes th
auth d cus es 3 type f i ju s () gunshot a l
m le w unl (2) l ur (3) fractures a l
fr ct r d l cati

The first group relat l in gnt cant acc it i
nd stingu shabl fr ms mis injuries in f ct d und r
there cum ta ces Wh t smore t fact rs are
pp eably to les ng complat ns nam ly
ffc t ly t atment and ab ence of gr c
tam n t n of the ound

Bu ns const tut v y pe al ed problem i r
t cally al ava th pr tected ha d a d fac a
olved Wh n th se burned a eas don th l ap d l
with m n mal cont ctu e s ious l ab l ty en ves
l cr ed f bro a d co eq ently gr at r c nt c
tur a a l r ct s l t p l ged g n l t n Th
l obl m ther f e n th t atment f b rns of the
h nds nd fce st c tr l m f c t on and t repla
l st sk n thout d lay M e v e f c to of th
h d mut be p ved It sten happ th t
y nts a e ope el d te d d stroyed b ch i
l es prolonged gr nulation M a ures m t l b
taken to pr t imp ment of th fu ct o of th
h nd by p e nt bl c nt ct

At the b gnng f th s a th application f ta
ica does me th f m f coag lant s almost
i r lly s d n th t atment f bu s While
th i st l ad q at t m nt for m ny types f
b rns it p es d t u n th treatm t f burns
f th hand nd fce The agul t r timent of
l r lep nd f its ecess on the m nt n nce of
t r l c l to s u d the o gulum Th n ly
can it b ed th t cau ing b r m In b rns of the
face v n th utt e d struct s m d g ce of
i sect nm t cu nd t atment must b d ted
to it c nt l n th d i g b f th f ce and
l l c tr ll f f tio l ble p rt f

the h al gpr ~ w th t it loughs para
much m l ly Alth ough nf ct s rves a us
ful i u po e while th slo ghs a paratng it m t
be l m t d at the tage f re ep th l zat f the
bu n Fp the l m ill g ww th am g pe d d th
b ta l s to t gr tha emo ed Th e bstad
are inf tion nd r gul gra ulat ons

To b ns of th f e the uthor r comm d dal
al n i g t f f pos bl i a al e bath i
l ess gs f ulfo m d p d tull gras a d a
f ep cks unt f ev ry l gh ha s pa t d As soo
as i nfect on u l c nt ol th emain n raw ea
are cove ed w th a spl t l g ft This minimizes
contr ct re and the eed f sub qu t plastic
par P t eular e mut be g n t the eyes n
ntr ct r nd th yes causes exposure of th
corn This n th p es ne of nfect on res l b
n lule r t n with l f the y In all cases
wh h th eye a e l ed pen culm is now instll d
to th conj nctiv l sac th s s v th ey wh h
ould other be ne tally lost

The rules g v n the t timent of b ns of th
h nd ar in tact ac d th s gical art pns
ples They a contr l i sect o promote l lag
p nt c t ctur d b e all preserve f
t n l l d sh l l bet at d th d ly l n b th
a d th s l f a m be tull gr d sal p k
baa lag d n th t th f g rs an b mo d ad
e c d d m the l g n g t p eser th f
tion S t st d th y n d t becom at f Th
gr lations a e co red ith pl t l n graft
oon as i d cat d t m p a y d t o t
f g mo m tal c mp th s n g r f
g of a bu ed h nd Th d to the immob l a
t n wh ch must b establ h d in rde that th
g f t m y tak l l i n come h v
th per d l m m b l z t does t e d fou
fi d

Wh n th buro d stroy s tend ns nd p j t
a th r c n d rat on mut g u d th co n h
tr timent S r l m it tion f m m rt r e h
f om bur of the d gr nd wh t mo em at e
m n s m t b f l t ted by th f nct o l po so
f the h d a d th d d by pr tabl
tr t e The th t e that in the R val A
f c t l ha d e s lly b ned worst the d
s m nd th h ct tie co tr ctu e of se e
burn f th d r s m of th h nd f s th m t ap po
ph lang l j l hypere t on O ce this co
tra tur h b e m t bl h d th r s o k n
means f resto g a y ncti what ce t
affect d d g ts Th a r b u ns f t p l m p du
flex cont ct e h s q lly d abl g Hand
thu g a ely bur d m t b spl nted pr sc rably
pla te the best fun t n l po tio th th
met u poph l g l j t n m d a n, t l
f i b u a k l u rs Th p t n t i e co
t d l p ch mov m nt f th h das p bl

pert with pec l care to v d any inc e n
tissue an ja th b st me ns of ma nt in g a s
the A t t l th r cyclo p pane is added if
nec ry

The most imp tant object f the mm d ate local
tr atment of pat ts w th m t l p l j s th
c nt ol f infect on Th fl ct d by care l and
the ugh ex c on ol wou d and the p event n
f l n necros s due t gross bo y d spl e m nt

A t fractures and fractu di locat on th m
m l t tr atment f these nju es call f r a c l n l
reduct f the displac ment so that the sk i p e
ery d and the c mpl cat on of ps s n t added to
th e t n g l e s n l m b n h h th e a f e h o r
a r c ntly m n p l t e l fractur o a r c nt wou d
l th r to acc l t r to op atio must not be
ncl c l n c m p l e p l a s t e Th p l t e r sh uld be
spl t s e nt l n g th a d the d s n g s and r t spl t
do t the k n th t r a c t o n a r y s e l l n g c a n t
ndanger th b l o o d up l to the l i m b

Th d s n t e t t m e n t f n j r e s c a n b g n
h n th pati t h r c o r d f o m shock and h s
g al ond t n a r a s t i When the s n skin
l o s o n d of l m o s t a y s i z e l i h e a l t h r m a k
a b l r a p d t y and r a c l i p l t e r i f i n f e c t i o n i s
a d q u a t l y c n t r o l l d C r u l a t i o n s n f l l u p a n y
d f e c t i n a p r o p e r l y v e d w u n d a n d f n l h e a l i n g
o n f l l s i f i n f e c t i o n r e s i s t a n s c h a w n d i t
i s d e t h t i d q t l i n g s f the w n d
a n d c o n c y n t p o c k e t g t s q u e s t r t n o f i n f
e c t f b o n t o r a n d a d f g n b d Th
o u d t h n n d f u t h r p l a t i t h r p r i s o n
f r f e d r a i n a g e s d t h r m o v l f a v f r g n b o d y
r s e p a t d q e s t u m

Wh skin has b n l t t e p r c e d u r e i d i f f e r t
A n y t e l o s u n d e r t h s k i n i m a d e g o o d b y
g r a u l t n s h c h f i l l t h d f e c t s n d c n t a c t i n t o
a h m c a b u t u n t l t h g r a u l a t i o n s u e i s c o
e r d w t h k t h e w o u n d n t h l d T o p r m t e
r a p d h e a l g o a w u n d e s J e s a i t h e
b u r t h e c n t r o l f i n f e c t i n n d t h e r p l a c e m t
o l o s t k b y a k n k f t U s u l l y q u i t e i m p l e
f o r m f s k n g a s t i n g a s s u f f c n t E p t h u m w i l l
g w e r o n l y f l t n f c t e d g r a u l t i n s T h e
w o u f s h o l d b c e e d n p l s t e r u t l i g g n u l
t i a s l i h w i t h t h e r f c e T h t h a
i s p p r e d f t h e c p t f s k i n b y c t i l y t h e
s a m e m t h o d t h a t s e d n t h r t m e n t f b u r n

The t e a t n t o l b o n a d j n t i m p l f i l l s
t h e d a r y m t h o d I n r r i n j s t h
t y a n d m u l t i p l c i t y l d e f m t i e r l i n t e
m e n d o M a s e b n g f t e a r e o f t e n d d t o
r p l c l o s t b n e r t p o d e t e a l i a t f r a
f r t u r l h c h t h l g n m e n t l d o t b e
t r l l e d b y x t e n l p l t s a n d v h h c o l f t b e
t r t e d b y e a l y p e a t b e u s o f a w u n d A
b o e g r f t s e n t l f o r t h f i r s t f t o p u r
p s e s d i t i s m u c h b e t t l a m t l p l t f o r t h e
s e c n d i t p o m t e s u s a d d t n t o p r d n g
i n t r a l f a x a t i o n o f t h e f c t u

A m m o t y p f j r y n a i f t e f
t h e s f n S p e c t u a h m u t l y b m d f o r

i n j u r y t o t h e v e r t e b r l c o l m a a l o e o r s a a
c i a t e d l e s o n s p a t i n t s n o l d i n a i r c r a f t e h e s
e v e n w h n o c c o m p l a i n t s m a d f p a i n t h e b a c k
A b t h e s p i n e s o f p t e n t s w i t h f a c t u e s o f t h e o s
c a l c e r s t a g a l s n o m a t t e r h w t h e y w e r i j t l
s h o u l d a l s a y b a m i n d s a f i x e d r o u t n e s e
p a t h e f o o t o f t e n m a s k m n m a l d i s c o m f o r t i n
t h b c k T h e m a y b e a n o b o u g r o s d
d a m t e n j r y c l w h e r e b u t t h e s p n e l p a t i
i n j u r e d b y s v e v o l n c m u s t a l a y b e x a m i n e d
b f o a u r e o f t r e a t m n t p l n n d

M t t i s J S E I T E M D

Ros J A R m o a l f P o j e c t i l F r a g m t s n d
l m m b i l i z t i n f W o d B t M J p a

33

I m m o b i l i z t i s a e t r e m l y i m p o r t a n t p a r t o f
t a n s p o r t t f t h e w u d e d G u h t w d
o f t h v r t b r a s h o l d b e i m m b i l d i p d d
p o s t e r i o r s h e l l f r a c t u e s f t h a t a b u l m n d
u p p e t h d f t h e f e m u a W h t m a p l a s t e c a s t
s h u l d b a p p l e d C o m p o u d f e t u s f t h e t b
s h u l d b i m m o b i l i z d p l a s t r c a t w h r u s
l l b o t h k n e P e t r a t i g p e r f a t i n g
u d s f t h e f i t s h o u l d b e i m m o b i l i z d i p l t
c a s t s O e h u d r d p e c e t o f a l l o m p o u n d f r a c
t u s f t h e o s c a l c s a r r i n i S t h A f r i c a
q u i r e d a m p t a t i o n W o u n d o f t h c a s t d f
a r m q u i p a d d e d p l t p l a t e r c a s t w i t h i m
m b l a t n f t h e j o i n t b o e n d b e l o t h t
o f f r a c t u e W o n d a f j u n t e e q u i m b i a t
t s E l e t n o f a e t r a t i v e c l e m m b l a t
c a s t c u t d n m a t e a l l y u p o n e d m a d c o n s t r i c
t i o O n t h e t h e r h a d f e s s e p l u n t a
d o n m c h b a m b y c a u i g s t i f f s s f t h j u n t
f t h h n d O e w d f c a u t o m u s t b e g r e n
w h e e x t e r m i t e s a e p u t u p i n p l s t e r c a s t
s p l t g a g r e n e m s t l w y s b e t h o u g h t f
a p o b l e c o m p l i c a t n

R I C H A R D J B N E T T J r M D

Bjorn R A Th Hea l i n g o f W o u n d i n e
G l e a H M d C h u 945 7 8

F l t y c a s f s u g c a l w o u d r s t u d i d i t
t r p e a l c d u i f m t h e s t a d p o t f t h e
m a l h a l g l o f t h t r a p e s O f t h s
u d 4 w e e i n f e c t e d I n 3 f t h j t h m
f e t n a s d u t a b r e k n g c a l t e h n i q
I n c a s t h e s b u i n f i t n a c l e
w o u d T h e p e r a t o n s w e p e r f m d t n d
v a d n a v l b a s e h p t l d t y p c a l l t r o p a l
c o d i o s T h e p r a t o o m w a s e p o s e d t o d u t
a n d d t b u t t w s c o m p a r t l b u g p o o f C t
t u t u w r e d u n l l e c t c a e
p e c b h t h a t t h e e t t h t e s e s
c f m m t h n m l h e a l n p e e s e b
c t t r t h r t h u g i c a l g u t u e d C a n e
h d l l t h t a c d e r e d f t h g t
t m p o t a d r y f i t a s m d t p r o t t
t h m f t h c a t d d t h a e d r e e
h e b u g t d t h a t l a n w u n d d o n t h e a l w
i n t o p c a l c l m t J H V J M A L O T V M D

White J C and Scoille W B Trench Foot and Immersion Foot *N Engl J Med* 1945 23 45

Ever since the epic retreat of the Greeks under Xerxes across the snow-capped Armenian mountains frostbite and related injuries to the feet from cold have been reported in the literature. Cold does not necessarily produce a single type of injury but a wide range of results in a great variety of syndromes which become most important when clothing, food, heat and shelter are likely to be inadequate and when a great number of soldiers are exposed to the rigors of outdoor life. Wet cold is far more difficult to deal with than the more severe degrees of dry frostbite as found by the American medical officers with the troops in the Aleutians.

The conditions to be considered here—trench foot and its sequelae, interpartum immersion foot—are both caused by prolonged exposure of the dependent lower extremities to cold and moisture. The knowledge of trench foot acquired from army surgeons who attended many of the Aleutian casualties of the war and who have made the data and criticism available. The immersion foot information is obtained through personal experience

with survivors of torpedoed vessels who were exposed to cold water during a prolonged period while drifting in the North Atlantic.

Survivors in a crowded lifeboat are forced to sit with their feet dependent and immobile. Thus also the pressure edema and frostbite with its hypothermia are an added factor. The edema itself is pronounced with uterine cold. Occasionally when a man is forced to kneel or sit for prolonged periods on the bottom of a rubber raft the same conditions are seen in the knees and buttocks. In the Aleutian landings men were forced to take cover in foxholes.

As semistarvation from the first fourteen days in military life, by day and night. During this period they had little to eat, were chilled thoroughly and had no opportunity to change footwear. Under these conditions all the cumulative causes leading to tissue damage in a crowded lifeboat are present—exposure of legs to cold just above freezing, circulatory dependence and immobility, and a general chill of the body.

Immersion foot and trench foot differ from frostbite simply because the tissues are not actually frozen. There are no ice crystals in the tissues above the freezing point of seawater and it thaws

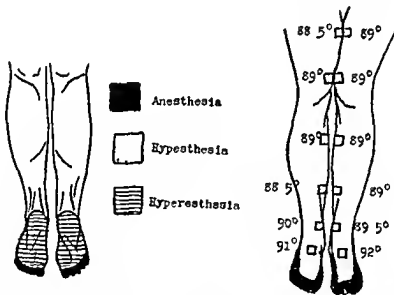


Fig. 1. Sensory changes in trench foot and immersion foot. The diagram shows the distribution of sensory changes in trench foot and immersion foot. The left leg shows a shaded area for anesthesia and a hatched area for hyperesthesia. The right leg shows a diagram with temperature markers (88.5°, 89°, 90°, 91°, 92°) and shaded areas for anesthesia and hyperesthesia.

T
R 80 88.5 88.5
L 80 88.5 89
Room 7 5

[illegible]

J K NAE T M D

OPERATIVE SURGERY AND TECHNIQUE

POSTOPERATIVE TREATMENT

La ge a eas th t have bee de ply burned sh ld
b co er d with epath lum by m a f k; grafts
t th e rliest opp tu ty It is ces a y h w
t wat t l hock It t n m b l t t

fluid elect ly balance al functi n d ma
nd t xema h e been cont oill d Al o t is de
able to d la th graft gu t l th p th l m has
been rest r l po taneo ly to llar f cond
degr burn T w it lore p the l zat n of la ge l l
th ckness def ts ho e er even th ough the c n
ta m l l iabl p th l l l d that e ntually
might p ad to c er the rea i usually u i
Gr ft ng h uld be d n early eno gh to vod th
pe d f d b l itat n lten as ci ted w th th
p ese c f la g gran lati g are s s v ral eeks
after a e ere bu n M ntenan e f nutritio with
part cular ef r nce t a d t h g i pr t i and
vitami C i t al espec ily if ea ly sk n g aft
g i c ntempl ted

It i d f ficult designate an exact time th t ill
at ly all of thes requ ements Surgical ci n
sh uld be do e in a fully equipped per ting room
p fer bly at some tim bet een the cond an l
th l e ks f l l w g th burn The pr c d of
exc ion f bur ed ti ues and early sk n gr ftu g
m v l be s d b th f r b r ed patients t e t d i i
ti lly th comp es i n type of dress g and tho
p n homeoagulum prod ci g dr gs uch as tannic
c d ith le nitr t r the dyes r u d l g n
l nesth t e is r q ired

Th bu ed area nd su und g lin rec l ned
tho o ghly w th a d t rge t l t on d d ap d
w th t le l e Th p oposed don r a a
prepar d im l n but s pa at ly All cr t e
t su s ci ed a much allet e be ngp cr d
a poss ble Th di ctio difficult d slo It
s p eferable to apply lin gr ft at th same ope a
tio f the o f i n of the pati nt p rmits b to cea
i n lly it may b ces a y to delay f r a f l v s
b f repl ing the grafts at cond p rat Sk
gr fts f i t rmed te th ck e r r mo l fr m
d r sit i g th l ad tt Blai r m th l a d
re fix d t th d n d d a ith e t n s t es
If th a ailabl d n ste do t pro de n gh
g ft to cover th d f i e t a ea completel th

g lts a e cut t sm ll q ares (post
f om 15 to 2 cm s ze and are plac i n
ne an th r s s i s i s ble ov r the entr d
they a e not sutured D o graft d r a r
ered th a s gle l ver of fine mesh ga z e
n ted th a g s ba e co ta n g a l l
e p t c tment and luminou e mpr
in are appl d in children or in dults
near joint a light pla t r co g may t t
r the ompre si nd e g l f po t l t e
l d es ing s ar left in pl ce for t eeks
the graft g p oc lure if it bec m s n
m ve them ea l i r the pro edure sh uld
red out i the p at g om nd cor
dres g shoud b reappl d t once
Appa ntly ea ly gr ft ing of sk f l l g
te s de f b r s m n m z s c tractu a
formity S m p tients v ill d o add t
c dur hut others v ll requ pl stic m t
contract res that have r ult d in s p t e f o r
g ft g l o such pat e ts th ea ly closure f
w und by th appl cat n of g afts f i t m
th cknes probably ll permit ea l plaster
J V E K a m x M d

ANTISEPTIC SURGERY TREATMENT OF WOUNDS AND INFECTIONS

W l k r J M d f l m l l r J W Th l m
me r of Acti n myc l w l l P l e f l l l
S t 045 t 373
I 6 c s f cti om y c f rabl eult
htain l w th p c i l n th raj alth gh th f f
up p r d ar t h r t t l i m p e m n t e
f o l n g e d t atm nt u u ally f r f r m s t
eks r qu r l
Th auth b l that a e mb nation of p
lin n l ullo am l m ght b employ e t t
tax a d s t h ne s i ty f a l r i
n d l t t penicill n whe th r m s i
f b a d s r n g W r H N A l e s M d

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Leitin J and Weyrauch H B Acute Obstruc-
tion of the Colon *Am J R* 194 53 3

Acute colic obstructed due to the to caecal or
volvulus presents definite distensible ro-
tation of the gas which permits an accurate di-
agnosis

In malignant lesions of the sigmoid the rate of
tumor growth is slow and permits the bowel to remain
in the tumor mass until its to and the whole the
back pressure delays the cecum and the ascending
colon

On the other hand volvulus of the sigmoid is a
sudden twisting of the intestine loop. This closed
portion rapidly becomes distended with gas. The
outlet of the bony pelvis is closed at times reaches the
diaphragmatic level

Nine case reports with film and lead
illustrating the value of the author's accurate map of the
colon R A B G M D

Kemp F H X Rays in Diagnosis and Localiza-
tion of Gas Gangrene *L* 1945 48
33

In the present articles of gas gangrene have
been far fewer than they were in the past of 1914
but the disease still remains one of the pri-
mary causes of death from wound

War Memorial issued by the British Army
1943 gives the following symptoms and signs of
gas gangrene as follows

1. Increased pain in the wound area with pro-
gressively appearing increased edema and swelling
2. A purple tinge in the absence of continued
hemorrhage and if shock has no response

3. A change in the mental attitude of the patient
which is difficult to define with accuracy this change
may be a fatal pathology or sometimes upho-
with or without restless

4. A wound which is relatively dry and at the
same time the change the exposed material and fat
at times being situated in a plum color in the middle

Occasionally the plumed attack is coming
may occur the early stages

Unfortunately the following signs alone
sufficiently distinctive and reliable for the
diagnosis of the condition is rarely grave. Some-
times the quivering and anguine cases
which will establish an early diagnosis with the
more difficult ninth fatality might be a hindrance

The following rays in the diagnosis of gas
is not just a matter of detecting gas in the
wound cavity but the following gas in which the
ray of gas in the soft tissues

All fresh wounds in the early days of the
wound permit air to enter the tissues. Sometimes
the patient may be let out of the cavity of the
bubbles

may be seen in the depths of the wound but in most
cases it is not observed unless the part is roent-
genographed. Air may extend throughout the entire
length of a limb but it never infiltrates the muscles
unless it is forced in under pressure. The amount
and distribution of air in the tissues varies according
to whether the wound is open or closed and with the
amount of tissue which has been lost. If a wounded
part is not immobilized movements active pas-
sage tend to suck air into the tissues

One of the authors recently saw a roent-
genogram of the chest showed gas outlining the fibers of
the pectoral major muscle on the left side as well
as well marked acute emphysema in the neck
and the left arm. The patient had a small penetra-
ting wound of his chest in the pectoral region and
with each breath he could be seen to blow air from
his chest into the pectoral muscle. The roent-
genographic picture of this muscle was very like the ap-
pearance of gas in fulminating gas gangrene

Once the injured part is placed completely at rest
air quickly absorbed. In twenty-four hours the
movement is considerably less and within three days all
but a trace has gone. The rate of absorption seems
to vary in different tissues being quicker for
muscle and synovial membrane than for
tissues. If the tissue is dead there is no absorption

Many other factors in treatment may influence
the roentgenographic picture. Air can be introduced
by changing a pack removing a stitch or by irriga-
tion. In one case x-rays showed a great deal of air
which had been introduced into the wound by the surgeon's
knowledge during the manipulation of an an-
tiseptic solution. Soft paraffin gauze tends to
improve the absorption of air and holds it in place
on the skin. When the tissue is necrotic
have been removed off the manipulation do not usually
suck more air into the tissues but a subse-
quent operation may permit it to enter. Thus the
treatment adopted must be considered with these
things in the significance of gas bubbles in the tissues

Local formation of gas in the depths of a wound
by gas forming organisms is a roentgenographic
appearance which closely resembles that of gas by
air. As a rule it is impossible to differentiate this
gas from a gas captured by serial roentgenographic ex-
aminations and only then if the observer is ac-
quainted with the details of the patient's treat-
ment is the question of the accident

Local gas formation does not necessarily mean
a wound of the living tissues by organisms for as a
rule the bubbles form in a hematoma or in a
dead body or in dead tissue. In such cases there
may be clinical signs of infection and the roent-
genographic signs do not in themselves demand surgical
intervention

It is very difficult to decide when gas is coming or
going from a wound to indicate the loose cellular

5. In the early stages of the disease, the lymph node metastases are found in which the radical resection can be taken care of by postoperative radiation.

All of the 9 cases were treated postoperatively with x-rays. The results were very encouraging in deed as compared with the high mortality rate reported by other authors. Six cases were cured permanently, only 3 advanced and inoperable cases terminated fatally. Most impressive is the report on an inoperable epithelial cell sarcoma in a man of thirty three years. A total dose of 5500 röntgens was given in 10 sessions (series 1-4 2500 röntgens during fifty sessions and series 2-10000 röntgens during the ten days). The patient recovered almost all symptoms and after 10 months and one half year after the operation

Patients and oesophageal years after the operation. In patients in connection with a later appendectomy. Localized the stomach to be free from any tumor. Operable cases are treated with gastric resection and postoperative roentgen therapy with daily dose of 125-300-400 roentgens with a copper or tin filter from 50 to 60 cm focal distance and a total cutaneous dose of 1 m in 500 to 3000 roentgens depending from four to six weeks on each of two anterior and posterior fields. Supplementary series were given after three months later in some cases.

Reoperation or antigen treatment is desirable and would probably further improve the results but in most cases it is hindered by the difficulty of the diagnosis.

Many cases of sarcoma are still often wrongly diagnosed as inoperable cancer on the basis of a biopsy report of myxoid tissue. It thus is often cited by the radiologist as a possibility. Therefore, a biopsy should always be done in cases of a possible myxoid sarcoma. W. E. R. M. So. W. M. D.

M takalil S Ca cin m of tl Laryn and
 Hypoph rynn Roe tgen T eatment and th
 Results of Therapy (U b d Laryn d
 Hyp ph rynn r m h e Roe tg b h dl s
 d d Erg hauss d Tb rap e) A t d i
 St 24 944 5 3

The material report by the author comprises 33 cases of carcinoma of the larynx and hypopharynx treated at the Central Institute of Radiotherapy in Helsinki, Finland since the foundation of the Institute in 1946.

The author divides his patients according to the location of the point of origin of the neurothrombosis in the manner that is commonly used by the general surgeon and the first reasons (1) because the end point in most of his patients was already so far advanced when they came under his care that it was often difficult to establish the exact point of origin and (2) because the type of the lesion is the material factor in determining its importance in regard to treatment.

Les h e e d v l e h s c r e i n a t t h l r y
g l l t h e h p o p h a r y n g a l t l e l v d n g l i n e l
t e n t h e l a r y n x a n l h y p o p h a r y x l i n g t k e n a
t h e f r e e d g o f t h e p l o t t i l n a l n g t h e r y
e p g l t t i e f o l d s t o t h e a r t e i d c a r t l g s i n t h e
b e k

The difficulties of classifying these adenocarcinomas of the larynx caused the author to create a temporary laryngeal class or group of these tumors consisting of tumors involving the epiglottis and adjacent area level site of cancers of the base of the tongue. These cancers he designated as cancers of the anterior all of the larynx. This group exhibited two notable characteristics: (1) 70 per cent of them developed metastasis to the region of the neck when they came under treatment and (2) they were found only in male patients as against 3 females in the group of 30 laryngeal carcinomas of the hypopharyngeal tumors 15 occurred in women. The absence of females with this type of tumor and the paucity with the two other types of laryngeal cancer is tentatively explained by the author on the etiological basis of this type of cancer generally that is Finnish women do not smoke very much and the Plummer-Vinson syndrome is extremely rare in women of Finland. Another justification for separating this class of cancers of the anterior all of the larynx although many of them probably originate in the hypopharynx lies in the fact that they more closely resemble the true laryngeal tumors in their response to irradiation treatment. For example of the 130 patients with laryngeal carcinoma 38 died five to nine years and of these 9 were free of symptom (a cure rate of 24 per cent) while 7 patients with tumor of the anterior laryngeal wall 81 died for five to nine years and of these 12 were free of symptom (a cure rate of absolute cure of 14 per cent).

For the purpose of evaluating the results of treatment for all cases of tumor of the larynx including tumors of the anterior wall were taken together as cases of tumor of the larynx to make a total of 238. Seventy-eight of the patients were living five years or more and of the ewer curd a rate of 8 per cent while of 37 patients with laryopharyngeal cancer we estlll ing after five years or more but only 1 of these could be classified as cured anab lute cure te only 8 per cent. Even s h e e r fall these cases are considered together we w ld stll ha 22 ab lute cures m ng 28 f v years rvi ls n abls but cu e rat of 8 per cent. The res lt compar fa o bly with the best r.

Its fsu g r y when on e f rs to W b c llect d figures sh ng that 87 (7 per cent) of 174 patients ef eo f symptom afte th e years f ll ing vari us operations f cancer of th larynge l

In the attainment of the above results naturally large dosages were employed in the treatment which was almost exclusively roentgentherapy. Stable life span rate 50% by 4 months of age 40 cm after 1 year (Thomaeus) ze 5% 6 by 8 cm 1 m rare 8 by 10 cm. Most frequent

To understand the rat onale of the t eatment it s
neces ary to explode 3 misc ncept ons (1) that
rad n oi tm nt add further damage to an ca al
re dy to he vily adiat d (The n cross is not a
direct seq el to irrad at o but a r sult of the inade
q ate blood supply of car t u similar t that
oberved in kel id f llo i g burns or in simple s r
g cal scars Sm lld e of rad n in a concent tion
lk than e tw ntieth f that req uired t prod e
cryth ma in the am t me allo v complete r covery
of the c lls in all thes instances) (2) that t ss e
rec very d e to th lpha r ys of the ointment
(The izat nd n ty of the beta and gamma ys
h char al o emitted during the proc s of decay of
the radon is l than e one bund edth of that fr m
the alpha ray) a d (3) that the ointment n th
str ngth ued h no eff ct on a m lgnant les n

It is the authors impr ssion that th alpha rays in
sm lld ses stimulate a d prom te the growth of vas
cular epithelial t sues Th e may b a parallel in
th effect f e ysm lld e f roentgen ray in the
tr atm t of inflammat rv les ns

The authors p epa e th ointment by br aking
dnary d n e d (1 cm lo g and ith a 0.5 mm
g ld wall) in a jar f hot vas line (melt ng at 44 C)
Mix g i pe formed by m lting and shak ng after
th jar has to d f twe ty f ur h rs The con
tents are tested f unform ty of d tr but n by
fl or se nec the d rk and the cti ty s check d
by measurement f the gamma rays emitt d by the
f ll j r h e f o use

Thi f shly epared ointment is th n ppld
lberally w th a pat lat the ulce to b tr ated a d
ab t cm of n rm lsk ns round ng t The th ck
ness of the tm t immat rial sinc th alpha
p rtcl h r ng f ly fracti n f m fl
meter in va l e but layer f fr m 2 to 3 mm will
gua d ag nst th ss of adon and thus nsu e a
more u i m tre gth d ing th ent e applicat on

The ointment co e d by a rubber dam or cello-
ph n the edge of v h ch a e secured to the sk n by
adhesiv plaster to p event d f sion of the radon gas

The conc tration of the ointment varies from
2.4 t 0.060 me per gram of va eline As a rule
applcat ons are l ft on for e ght hours and epeated
one a week for th ree on an av rage The addition of
10 pc e nt l nol n t th i tm nt makes no d ffer
ence as far as the p n tration f the a ion nto the
t ss es is concerned In the nterval bet en the
ad n treatments unguentum a di borici (o p
ce t) or u guentum of i m rruae vith va eline are
appl d

Altog ther 69 ulcers er treated Of these 2
prov d to b recur ences f the original malignant
lesion 41 have been compl tely heal d and 8 im
proved to such an e tent as to be nol ngers u pected
f being recurr nce No example of simple necrosis
has failed to respond Inf ct al ck f respon e con
st t tes an lmost sure sign of m lgnant recur enc

The authors lso sed the method in 7 r c leit nt
cases of ch nic ar c se ulcer t tal ng 5 s p rate
are N ne areas h l d promptly 5 mpr ved and
only 1 failed to show any respo e Th e chron c
ulcers in scars f llo ing burns nd surgery in hich
n radation therapy had been gi n likewise healed
completely

T o ca e r ports r incl ded in b ief rés més to
llu trate the m thod of p ocedure and the subs
que t cl nical course of heal g

The c nclusion s dra n that the cellent mmed
t result w ll j t fy th u f the radon ointm nt
not ly in postirradiat onal ulcers b t al o n ther
ben gn chron c ulcerat les s The t me s too
short as yet to as ess the perm n ey of the res lts
It is believed h w er that the fi ld of application
could b exte del nd that th m thod may al o be
of a tanc in military surg v

T L cr MD

tw lat al filds wre u d th small ant r
field added occasio nly wh th ewe l gem tas
tases in th gon fth n ck a poster r field n th
s d of the metast w adj ned D ily dos ges
c nsist ding eral of o oe tgens h tas much as
300 r tgens ha ben em ploy d All entg
dosages we calcul ted ag inst th kn The t t l
dosage va id f m 6000 to 7000 roentgens nd
th t tal peri d of tr atment thu lasted ab ut a
m th

W th such dos ges f c urs s e r a t i o n s n
th t es f th th o t m st be pect d nd the
tho b l es th t om p t i e n t s ha e e n t u a l l y
d d f p l m o n a r y c o m p l i c a t r e s u l t g f r o m th
at o h s a d c a t i c i l c h a n g s d u e to the ir d
t n t s e l f N e r t h l e s h b e l i e v e s t h a t the r
u l t s b t a n d n c a s e s f c a c n m a f t h e l y n x a
f a o b l t h a t o e t g n e r a p y s h o u l d b e t h
t t m n t f c h o c i t h t h t y p e f c c d t h t
s g c l t r v n t s h l d b p f o m d n l y a s n
d d t l m a s u e J u n W B r ~ M D

Ek R and P ppe E P m r B n S c m
11 d l S t k h 94 3 387

From May 1931 to S p t m b e 937 a t t l f
3795 pat e t th malig ant tum rs t e t d
t the N rwega R d u m H p i t a l O f t h e 42
1 p cent p e s e n t e d c a s e s f p r i m a r y c m
of bon

In the pres t t i c l e th u t h r n a l y t h a
o a s p e c t s f b n e s a m a d c o m p l i c a t i o n s t u s t c a l l y
4 f t h e 4 c a s e s o b e d O e c a s n t f l
l o w e d p l 32 a s e s t h e w s m s c o p c o
f i r m a t i n the o t h e r t h o t g a p p e a d
s b s e q e t c l c a l c o r s n s t i t u t d t h e t o f
d g n i

Th foll g c l s n e a t n w a e d n t h i r s
f tumor

Ost g c s e s () s t e b l t c (c l u d i g
c l e o s g) 8 c a s (b) t e l y t 4 c a s

Ch nd oma s e r e s () c h o n d s a m 7
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3 E w i n g c o m a s c a s
4 P r s t l i b o s a r c m 4 c a s

5 U n l s f d c a s

Th ir d a t n c o n s i s t d f p t t e d f r a c t i o
a t d c t g e t h p e p t i n f t h c a s e s
i n w h h a d m w s d T h t b c a l f c l o r s
w 75 k v m m f c p p e m m o f l m m m
4 m a 6 c m k i t a g e t d s t 5 o e n t g m m
u t e s o o t 450 o e n t g m a u r p n e e 30 m
f i l d f o r c r o s f i r i n g 4000 to 4500 e t g e n s p
f i l d i f o n l y f r m t o f i l d s w e d t h e t o t l
d o s e p f i l d s l i g h t l y h i g h i n s m c a e
s c d s e s f u r r a d a t w u d t a k f m
t h r t o f u r m n t h s l t w t h t o t l d o e o f f m
2000 to 3000 r o n t g p u l d

Th a t h o r s r e c o m m e n d t h t c o m b i n a t i o n f
s u g r y d r a d t t h p y b d w h n
p o s s i b l e i n a l l g r o p s f b n s a m w t h t h e
c e p t o n f E w i g t c m n w h h i r r a d i t
a l s d i s b l

J t h o s t g c s s e s 3 t f f a p a t i n t l o w
f i e y a r s l o n g r a f t e r t h e f i r s t t r e a t m t t i
c h o d o m a r i e s 2 t f n t h e E g a
m a e s e s 1 t o f 5 a d t h e p e r i o s t e a l f i
r e m a s e s 14 n n l d s l o g a s f e y a
Th u f o r t h e t r s e r e s t h e f i 3 a r s r a t h
m n t d t o 6 n a r l y 5 p e c e t

The a t h o r s g u e s t a b l e b u c h t y b a r
c m p l i d n d e t l t h e m t h d o f t a t m t t h e a
a d e x d s t b u t o a s w l l a t h e t e f t h p
m r y t m o r i n t h a r s g o p s F v e o f t h 6
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s e r h e d n b e f r s m e s n d t h e p e c t e o e t
g e n g r m s n d p h o t o m c r o g m s i n l d d f
t h p u r p o s f l l t t n T L t r M D

MISCELLANEOUS

Chyd mus J J R d i t l n i n j r i e s f t h l t e s t
t i n a n d U r i n a r y B l a d d r C a s d b y R a d i m
T e a r m n t f C a r c i n m o f t h U t r i C e n t
(S t h l b d d D a m d d r H m b l a s e
b d R d i m b h d l u d e s C r e n m
t n) A l a d l S t k h 94 3

The a u t h d c u s s s f 32 c a s e o f c
c a l c a c r n o m a t e a t d b y i r a d i a t i o n w t h d i
I 33 o f t h c e s t h e e w e e r t a t n o s o f
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t e (u l c r t r a c t u s f t h r t u m r e c t o a g a l
e s i c a g l f i s t l a s) T h e t e r l b e t w e n t h
d u m t h p y n d t h o e t o f t h c m p l i c a t
a e d f o m f i e t o t h t y m o t h T h d t a b e
t e e n t h e t m n d t h e c t u m v a d c o n s d
b l y a n d t h f o e t h e d o s d e l e r i n t h e r e t
w e r e s u b j e c t t g t a a t o n s T h e m e t h o d f
m e a s u r w t h t h d o a g t e r m o f m i l l i g r a m
h o u r s a s t f t r y a t d e s t w t h c r a n t
o d i n g r y t o t c t i o u s s t r u c t e s T h e v a
t o n s i n t h e p o s t f t h e r t u m r d m o
t t d i n r o e n t g e n g a m s

Th e m u c h r o m i i m p o e m t o l t h d o s
g c a l l a t n i f o c a l d o s c m a s e l l a t
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n t h e A c t a O b i t e t G y e o l g c S a d r
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d m a v b d i t h a f r e m e n t i o e d p u r p o s e s
W v e M S o l m i t M D

C o p e r A G S a n d R b e r t D F T h e T r e a t
m n t f P t i r r d t i n l U l b y R a d o
O l n t m n t M e d J A t l 945 97

Th t e t m e n t o f p o t d t n a l l e e r s w h c h
c a n t a n t l y b g o b r v e d n r d t h r p e t o
l e s n s t t t d t h p t d f f i c u l t d d i s t
g p o b l e m T h e a d p t b y t h a u t h r s 1943
t h e p p l c a t f d n m p g n a t e d a s e l e a s o t
l d b y U l m n h l e d t h e p o b l m t h t
B r s h G e n e l l l s p t l l l c a s a c p l t h o r
d t h r d o s g

To understand the rationale of the treatment it is necessary to expel three misconceptions (1) that radon ointment adds further damage to an already irremediably damaged area (The necrosis is not a direct sequel to irradiation but a result of the inadequate blood supply of scar tissue similar to that observed in keloids following burns or in implant granulomas. Small doses of radon in a concentration less than one twentieth of that required to produce erythema in the same time allow complete recovery of the cells in all the instances) (2) that the recovery is due to the alpha rays of the ointment (The ionization of the beta and gamma rays which are also emitted during the process of decay of the radon isles than one one hundredth of that from the alpha rays) and (3) that the ointment in the strength used has no effect on a malignant lesion.

It is the authors' impression that the alpha rays in small doses stimulate and promote the growth of a cellular epithelium. There may be a parallel in the effect of very small doses of roentgen rays in the treatment of inflammatory lesions.

The authors prepare their ointment by breaking ordinary radon (1 cm long and with 0.5 mm gold all) in a jar fitted with a valve (maintained at 44°C). Mixing is performed by melting and shaking after the jar has stood for twenty-four hours. The contents are stirred for uniformity of distribution by stirring in the dark and the activity is checked by measurement of the gamma rays emitted by the full jar before use.

The freshly prepared ointment is then applied liberally with a spatula to the ulcer to be treated and about 1 cm of normal skin surrounding it. The thickness of the ointment is maintained in the alpha particles have a range of only five to six millimeters in vaseline but a layer five to three millimeters will guard against the loss of radon and thus insure a more uniform length of application.

The ointment is sealed by a rubber dam or cellophane the edges of which are secured to the skin by adhesive plaster to prevent diffusion of the radon gas.

The concentration of the ointment varies from 0.25 to 0.660 mc per gram of vaseline. As a rule applications are sufficient for eight hours and repeated once a week for one to two months. The addition of 10 per cent lanolin to the ointment makes no difference as far as the penetration of the radon into the tissues is concerned. In the interval between the radon treatments unguentum acidi borici (10 per cent) or unguentum lei-mor-huac with vaseline are applied.

Altogether 69 ulcers were treated. Of these 30 proved to be recurrences of the original malignant lesion. 41 have been completely healed and 8 improved to such an extent as to be no longer suspected of being recurrences. No example of implantation cancer has failed to respond. In fact a lack of response constitutes an almost sure sign of malignant recurrence.

The authors also used the method in 7 recalcitrant cases of chronic varicose ulcer totaling 15 separate cases. Nine areas healed promptly, 5 improved and only 1 failed to show any response. The chronic ulcers in scars following burns and surgery in which no radiation therapy had been given like these healed completely.

The authors' reports are included in brief résumés to illustrate the method of procedure and the subsequent clinical course of healing.

The conclusion is drawn that the ointment is effective results well just by the use of the radon ointment not by postirradiation ulcers but in the benign chronic ulcerative lesions. The time is too short as yet to assess the permanency of the results. It is believed however that the full application could be extended and that the method may also be of assistance in military surgery.

T. L. CL. M. D.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Sit t H H Walk J Jr Rh ad J E nd
Lee W E Th I flu nc I Loc IT tment
f Bu n n LI F n t n A S f 94
9

Th r lat f the l al tr atm t of h r s to
h p t c dam ge v h c h i th p t has bee ap
p o a c h d i t h e r b y a m l e p u m e t s r b y a s t d
of th p tholog cal h ges fo nd f t l cases at
a t p y u g g e s t d t t b e a u t h o r s a s t d y c c r n d
p i m i l y w t h t h e f u n t o n l c h a g s n t h e l r
Most of th p t n t s r v i d I t i s m p o t n t to
d e t e r m e t h e e f f e c t h e r f c t o f o t o l
t n c i d b u t a l t h t n g a g i s T o
o t h q e s t i o n s a e f c n d b l t e s t ()
t h h p t c d a m g e f o l l o g t h e u s o f t n n a c i d
l c a l l y a c a u s o f i n c r e a s d m o r t a l i t y d (2) i s t h e
h e p a t c d a m g e f o l l o i n g b u r s n e l y d t o
t h r a p e t i c a g e n t s u d t h e l a t t e m t i f t h e
b n e d a e a s ?

The s l e c t o f h e f u c t t e s t s d i f f i c u l t
s i c e t h l i p l y s a n m p r t a t o l n m n y
m e t a b o l p c e s I n a d d i t n t h l i h a s
l a r g e r v e a n d r a p d p o w e r s o f r e g u l a t i o n o
t h a t m u c h v e r d a m a g m y o c c u r b f a n y c b n g
c a n b e d e m o s t a t d b y l e r f u n c t i n t e s t s T h e
t h o r s u s e d t h v n d e n B e r g h t e s t t h e b o m s u l
f l e r t t d t h e h i p p u r c a c d r e t o n t e s t a
d f l o c c u l t i o n o c p h a l n b l e s t e o l m u l t i o n
t h s r i e f p t n t s

T n i c a c d w s s o w l l t a b l i s h d i n b u t h e
a p y t h a t i t o o e o f t h o t h r t a n i n g m e t h d s h d
l g l y d p l c e d o t h e r m t h o d s f l c a l t h e p y i n
t h i o u t r y a n d t a c o s d a b l t n t a b d
E m p h a s o n t s h e p t t x p r o p e t i e s b y W l l a d
h c w o k e r s c a m e a t a t m w h n t h s l
h g e s f o l l o g b u r n w r e b c m u n g o f c r a s
g m p t c e p m a b l y a s t h e r e s u l t o f m p o v
m t s i n t h e t r e m e n t o f s h o c k H o w e r t a k e n n
j c t o w i t h t h e u t o p s y d t a r e p o r t e d b y E b
F r m r a d M g n t h e c a n b e t i t l e d b t h t
t h e t n a d d i n b m r t h a p y i s b s b d
f l i c e n t l y t o c r a t h p t c d m a g e

T h m i l d n e s o f t h h a g e s i h e p t c i f u t n
m t f t h e c a s e s t a d l c a l l y b y h c h s
m t h d s r y g t f y g n d w b l t h h g e s a e
t l l d e f n t t w l d m t h t t p d m c e
f h e p t c d m e b n t e m a s d e c r i b d b y
W l o n M c G g a n d S t w a r t a n d P c k b a b n
d i e l g l y t t n g g e n t s

T h e q e s t o f h t h i a c a c d a c t l y
c a u e d t h d e t h f b r n e d p t e n t s c a n t b e
a n w d c o m p l t l y I n t h e s n p a t n t w i t h
h u n s f l e s t h a n 4 p e c t d d f t t n n a c i d
t h e r a p y c e p t a b p d t a t o p s y t
h a h a d a d d p t m

A g t e a n t a s p e c t f t h e a u t h o r s p e c e
b w e y h h e n t h f a c t t h t s i n c e t n c
w a s d c a r d e d p a t i e n t h s r v i d b f
r a o p e r t o t h h d y s r f a c a d l y h a
r v e d b u r n s f 3 5 p c n t o o v l t e m l k l
t h e r f e t h t w h i t n n c a c d m v i c r a l
d a m a g e w h e d t h e l o c a l t e a t m e n t f
b u r n t s u s h a s n t h e n a t t e d d h y g e t m
t a l t y J H v E K i r e i M D

GENERAL BACTERIAL PROTOZOAN AND PARASITIC INFECTIONS

Fish A M Th Th rape t i v i f P l e d l l
A p p l i d L o c a l l y B d n E p e r i c l t h t h
C r u d M t r i a t i n a v r i t y o f f i c t l B u l
J h H p k H p q a s 7 6 3 4

A n y d I a n t b a c t e a l p a g e t f o r l o l p p l c a t
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p a t h l o g c l b o d y f l u d () o i h i b t n b y t h e
b o d y f l d (3) o t o x t y t h e c e l l c a l l y t
t b b l y g e r a l l y (4) n p d c t o o f f c a l a n d
g e n r a l h y p n s i t i t y (5) r p d c t o a g i n s t a l l
b a c t e r a b g h d i t i o n a n d (6) s b l t f l
t o

S c h a p f a t a b c t e r l b t n c e f u l f i l l g a l l
t h e s e c t r a h a s n t b e e n f o n d v e t S H
m d a e n l y b a c t t t c d h b t d b
p u s t h e y p o b a b l y p d g a l d h y p e
e n s i t i v t y T y o t h r n s l m t d b y t a c t c
c t i o n g t g r a m p o s t c c i a n d h y h g h
y t e m c t c y p c l i n i s h i g h l i b l
w t e s l l t d b o d y f l i d t i s n o t
b i b e t b y y b o d y f l d s n b y p m n o b e n a r
c d t i s n t l c a l a t b n g e t m l y
a a d g a r l h p e r s t t y r a c t i o n s h a r
l y b e e n r e p o t e d T h c h f d a w b c k s i p e n c i l l
a r r e l a t i t b l y n d l i m t t c t e b e
t e r u c h a s t h t p h y l o c o c c (e p t) p e r c e n t
r e s t a t s t a s) s t p t c c (e a r l y a l) a n e b e
t p t o c c m n n g c p m o c c e i g o o c o c
d t r i d w e l c h a d e r y n b a c t e r i a d p h t a e T h
r s t a n t h c t e a e t h e e s c h e c h u a c l b e r t h e
t y p h s b l l p t e p d o m o n a s a e r u g o
(p y y a u e u s) b l l s l k a l g e n e s a l p h a t p t o c
c u s f e c a l i s h m p h i l u s i n l i n a z a e a r o b t
a e r o g e n e s d i f d i n d e b c l l S o m e t h e r e
e i s t a t b t p d e p e n c i l l n a s e h c h
c a p a h l o f n e t a l i z n g p e n c i l l i n

A n u m b f i n e i g t r s b a r e p o r t d f
b l c l u c a l t a l t h t h l c a l u i p e l l
d f f i f m s a n d c t r a t o f f c t n f
t h y e m a s t o d w o u n d s d e s a n d l
w u d s b n w d s m p y m a d o s t
m y l i t u s

T h e a u t h o r s e d f i r s t t h e F l e m g t r i n f
p e n i c i l l i n d l t r t h R C t a a f i
c u l t f i l t a t T h l i t t e p v e d t b e a b o t

do bly pot nt with an a erag f 100 unit per cubic centim ter Generally the procedure was as foll y s (1) culture of th wound (2) wide necision f the u d with removal of dead t ssue when necessary and (3) continu d saturat n of the wound th y nicill n until the su unding tssu s tart the p ocess of epa r

Ninety five ca es tr at d with crude penicillin are reported some pat nts r ceived inj ctions of penicillin along with local applicat ns of the drug The r oses were ost my lts of the long bon s chr n ca dacute frontal bone osteomy litis st epto co cal throat i fectio s (ncludi g streptococcus car neri) w nd inf tions and eye infecti s

Th t l results y re good y 63 per cent poor in 13 pe cent and undefin te in 24 pe cent Co centrat ions of from 25 to 100 un ts per cubic c ntimeter were u el and w re consid er sufficient since d lu tions of 0.6 units per c llic c ntimeter ha e b n shown to kill staphylococci streptococci and pneumococci in vit o

Car f l bacteriol g cal determinat n of pen cillin s it y f the inf ct g bacteria sh uld alwa precede actu lte tment hen infection le pe the combinat n with th systemic se f p n cillin r with sulfonamides o ty thricin m y l advis able These drugs ar compat ble in combinat ns

The local applicati n f penicillin for localiz d infect n appe rs m r economic l s d effi c t provided the lesion i open and the inf ct on n t too d ep but g ral u gal p inc pl s ch as d n age of p s rem l f quent r and excision of d ad tis ue must n t b n gl cted

ARTHUR J ILES, M.D.

DUCTLESS GLANDS

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Thyrotic lls (Ex phr) Imic Golt 1 h
S f 945 5 5

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Th a th r l s nts th case beca e of th t m ra it f hth l m c g ite as cst d th ch on c th roit

FLOL M M.D.

Ba l E C Th U f Th acil in the P
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Hyperth idl m A 1 f 945 105

Th a th repo t s s 64 cases f h pe th r d m tr at l th th ur el a l ub g ntl operat d pon at th Lab Cinc fl pat nt were se el t v c d d w ldt b n po per at r k s if prepa d th Lug l l t n al

Cal ex p c l l t th co d th t l th ou acil pat nt h uld th n f pe at until a n m l t n arly mal basal m t bol m

recorded Th time requir d t reduc the ba al m tabol m s roughly one d for each per cent to be reduced In this sen e th average p etreatment basal metabolism rate was +51 per cent and an aver age of fifty-eight days was requir d f r low ring the metabolism to the proper lev l for surgery Tho pat nts who had p eviously receiv d Lugol's solu tion requir d a longer treatment with th urac l There was an average gain in weight of 13 p unds the g atest gain was 30 po nd The treatment of patients without heart f ilure was ambulatory with exam at on and a blood c unt e ery two or three eeks Patients with heart failur ere h spitalized

With th o acil t eatme tal e the thyroid gland at operat n was found to be soft and friabl and to bleed excessiv ly which increa d the ope at e diffi cult considerably Thi as ve come by starting iod ne adm i tration as soon s the basal metabo lism s te had reached +2 per cent cont nng th ourac l for another three eek and th n g v ng iod e al ne for ne week befo e surgery The nes the ja and postoperative co rise we e uneventful

T xic action w re encountered in 8 of 19 ca es Only 1 of these was includ d in the 64 cases of the pr nt repo t On pat nt e hibited a skin erup tu 4 h d f ver and 3 developed leucopena In ery t stance symptoms of thourac l into cat on ubed on d continuanc of the drug

The a erage hosp tal stay nd f th ouracil as l oms en to ten days und Lugol's l tion alone ve al w eeks

CLYDE H. THURTELL

SURGICAL PATHOLOGY AND DIAGNOSIS

Web t A St nhouse E Pars n E Phill p
A and Oth ra A St p in Canc Contr l
Ill oi 3f J 1945 87 9

The sha p ncer ase in deaths f om canc is read ly nd stan labed becau f the ncrea e in kill in m dern d agnos and the prol ng d l f pan In order t impro e the stat tics for tr tment dag n is must h mad e ly and adeq t treatment begun while th e is a chanc to d st oy the neu pl sm

Th cancer c ntr l Imic etup Chicago i ponsor d by the Ill n s Div on f th Field Army f th cont l f cancer and the pu pos of the clincs t pr vid peiodic am nt ns to appar ntl well omen in an att mpt to d t e early n pr cancer o lesions i treatment is are g en i th cl c f f uspc l es n e noted th p t nt ef redt h l mly ph cian f further i gnac c t gati a d f re

F h p t ent n n th cl c t i On the f t i t a d aled roe cal and ocial h t v t k n and a complete ph y cal am nt n i mad The l b atory o k ncludi u al complt blood c nts and r logy tests cov al ndur th l means nd chest fluo oscop O t l nd s th e l t f the u t l xam t n ar int j r t f the pat nt and h l adv t con lth n ph y sician f an otl r m stig t n d at l

TABLE I — PELVIC FINDINGS

Condition	Number of Cases
Left inguinal hernia	1
Scalp abscess	6
Scalp cyst	3
Left inguinal hernia	4
Uterine leiomyoma	3
Vaginal cyst	9
Cervical (with symptomatic)	6
Leucorrhea	73
Pelvic lymphadenitis	9
Tuberculosis	5
Corpus uteri	8
Fibroid	35
Pelvic lymphadenitis	3
Adenocarcinoma of the endometrium	4
Right adnexa	5
Left adnexa	5
Tumor of the broad ligament	
Stricture of the urethra	

The purpose of this article is to report the results of the first 600 patients.

Of the 600 patients, 214 were seen by the dermatologist and of these 80 had clinically diagnosed skin cancer. 5 had ulcerated melanoma and 2 had pyoderma. 8 had basalomas. Eighty-four patients had pyoderma and 2 had pyoderma and melanoma. 5 had melanoma and skin conditions.

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TABLE I — PELVIC FINDINGS

Code	No. mbe Case
I t m l G t l	
K is	
Seml pru tu d g t	6
S b co yst f l b	3
L b m h t i	
E l rred ba th h gl d	4
U thr l ru l	3
V ginal cy t	
Cystoc l (th ympt m)	9
C xx	
La rated hyp i ph d	6
E	73
P hyp	9
Tri hom na	5
C rp	
R t t d	8
F b d	3
P l p	3
Adn mass nl ed ry	
Right d	4
Left sid	5
Bl t l	5
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Forty t women c mpl ed of s n s t e b casts

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SURGERY

GYNECOLOGY AND OBSTETRICS

An International Magazine, Published Monthly

VOLUME 81

OCTOBER 1945

NUMBER 4

II THE VALUE OF THE VAGINAL SMEAR IN THE DIAGNOSIS OF UTERINE CANCER

A Report of 1015 Cases

JOE V MEIGS M.D. F.A.C.S. RUTH M GRAHAM B.S.
MAURICE FREMONT-SMITH M.D. LOIS T JANZEN B.A. and
CAREY B NELSON B.A. B.S. M. Ch. sett

EARLY accurate diagnosis of cancer of the female genital tract has long been the goal of gynecologists. Ewing (3) states that in 1931 14,464 women died of cancer of the uterus or 12 per cent of all cancer deaths were due to this one type. This is exceeded in frequency only by carcinoma of the stomach. Ewing arrived at figures of an average of 10 per cent approximate 5 year cures for uterine cancer. He calculated that the possible cure under ideal conditions is intelligent public skillful and experienced specialists and modern equipment would be 40 per cent. The discrepancy between the possible rate of cure and of actual cure bears a direct relationship to the time at which diagnosis is established and treatment instituted. We feel that the vaginal smear technique for diagnosis of uterine malignancy is a definite forward step in the early recognition of the disease.

In 1943 we (2) reported 220 cases studied by vaginal smear for cancer. This report confirms the previous findings of Papanicolaou

and Traut as to the value and accuracy of the vaginal smear as an aid in the diagnosis of uterine malignancy. Since our last paper we have studied an additional 795 cases making a total of 1,015 cases studied by this method with a total error of 4.0 per cent. The patients for this study came from the Vincent Memorial wards and the Tumor Clinic of the Massachusetts General Hospital and from the private practices of several physicians.

NEGATIVE CASES

Of the 1,015 patients 861 showed no evidence of cancer. Of these 36 per cent had biopsies either of the cervix or of the endometrium or the whole uterus was removed. These proved negative diagnoses are listed in Table I.

In addition to those shown in Table I our negative group also includes 48 negative postoperative and 89 negative postradiation patients (Fig. 1). These women had proved malignant growths of the uterus treated either by x-ray, radium or surgery and are now clinically well. Also included are negative cases patients who did not present enough evidence for malignant disease to require

From the Vincent Memorial Hospital, Gynecology and Obstetrics, Massachusetts General Hospital, and the Tumor Clinic, Massachusetts General Hospital.

operative procedures. In this series of 861 negative cases 5 mi taken positive diagnoses were made by vaginal smear. These we regard as mi takes since repeated biopsies were carried out in all cases and in none was microscopic evidence of tumor found. This represents an error of 2.9 per cent in negative called positive. These mistakes will be discussed in a later paragraph.

POSITIVE CASES

In this series of 1015 cases 154 were shown to have cancer on microscopic section. The positive cases and their pathologic diagnoses are shown in Table II. Of these 154 positive cases (39 endometrial and 109 cervical cancer) 16 cases were incorrectly called negative by vaginal smear. This is an error of 10.3 per cent (see Fig 2). Of these mistakes eight were in the endometrial and eight in the cervical cancers.

The mistakes in this group of cases fall into two categories. The first includes smears in which cancer cells were present but were not seen on the original examination of the slide. On review of these smears the cancer cells are so obvious that there could have been no question of interpretation. These cells were missed because every field was not examined. Seven of 16 mistakes were of this type. The second group are those in which no cancer cell were found even after the slide were reviewed. We must assume that in these 9 instances malignant cells did not exfoliate or that degeneration of the malignant cells had occurred. We are including these in our mistakes. They actually present a limitation inherent in the method. Of these 9, 6 are from cases with endometrial cancer. The fact that

cell from endometrial carcinoma frequently fail to appear in the vaginal secretion explains the lower diagnostic accuracy evident in this group.

We will review briefly the criteria for the recognition of cancer cell in the vaginal secretion. More extensive descriptions including technique and staining may be found in the monograph by Papanicolaou and Traut or in our previous publication (). The basal cells are round or oval cell with green cytoplasm and an active vesicular nucleus. These cells may vary in size. The second group are the precornified. These cells are larger and more transparent than the basal cells and have a smaller vesicular nucleus. The third group are the cornified which are similar to the precornified except for an acidophilic cytoplasm and a pyknotic nucleus. Endometrial cells are encountered occasionally in the vaginal secretion. These cells are very small and have a small vesicular nucleus with very little cytoplasm.

Malignant cell show a good deal of variation much more than is seen in the histological section of the same tumor. The cell shed from an epidermoid cervical cancer are of two types depending on whether the tumor itself shows any differentiation. The differentiated cells show extreme variation in size and shape. They may be extremely elongated resembling very closely a muscle fiber cell except for the long hyperchromatic nucleus. They may be rounded at one end with a long tail—the tad pole cell. The differentiated cell have an adequate amount of cytoplasm but it is abnormally distributed.

The characteristics of the undifferentiated cells are as follows: (1) they occur often in groups (); the nuclei which are hyperchromatic show marked variation in size even to 100 per cent; (3) the nuclei stand out against a homogeneous background of cytoplasm in

TABLE I — PROVED NEGATIVE CASES

Ch n r t	06
F l y p	36
End m t u l hyp pl	3
F b d	70
E d m t n	6
M s c l l a e o	9
A d m y t	
At p h i d t m	3
Secret r y d m l n	
P l e r a t d m t n m	6
N d f u l u n c	—
	3

TABLE II — POSITIVE CASES

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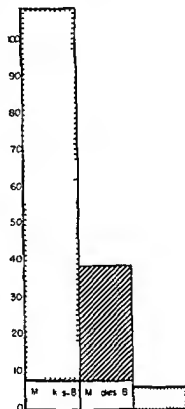
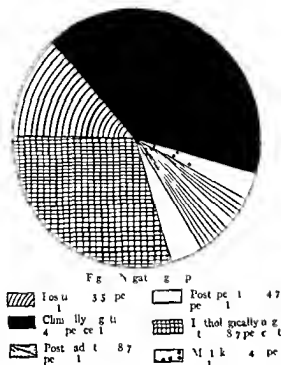


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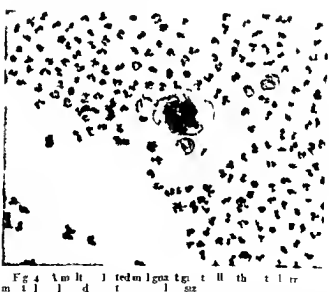
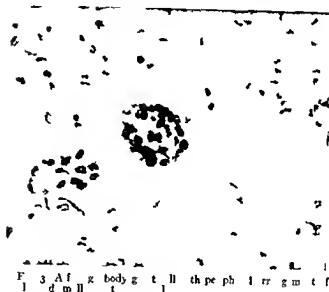
which cellular borders are often indistinct. If single cells are encountered an increase in nuclear size in relation to cytoplasm is the most important diagnostic aid. Adenocarcinoma of the cervix also shows cells of this undifferentiated type.

The diagnostic criteria for endometrial cancer are similar to that for undifferentiated cervical cancer. The cells have large nuclei with little or no cytoplasm. The cancer cells from endometrial cancer are more likely to be present in clumps with the cells in a dense mass. The size variation of the nuclei is not as great as seen in cervical cancer.

In reviewing our mistakes in the group negative called positive (false positive) we have found certain cells, probably histiocytes, which often give trouble in making the correct diagnosis. In our 25 mistakes, 6 were incorrectly diagnosed positive because of the presence of these cells. There are 3 types of histiocytes. The first and most familiar is a large cell with vacuoles containing ingested material such as red blood cell and leucocytes. These are easy to recognize and are not the source of trouble. However, the next two

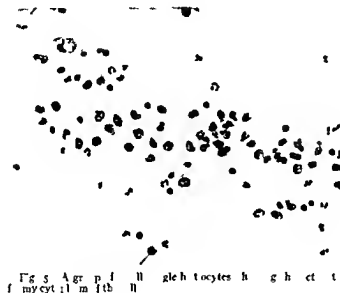
groups have proved to be very misleading. One group comprises the foreign body giant cell. These are very large cells with sometimes as many as twenty nuclei. The nuclei are apt to have a characteristic peripheral arrangement (Fig 3). Occasionally, however, there may be so many nuclei that they occupy the whole cell. These foreign body giant cells may be interpreted as malignant giant cells if careful attention is not paid to the regularity in size of the nuclei and the adequate amount of cytoplasm present. These foreign body giant cells contain many nuclei which do not vary in size appreciably, while in the malignant giant cell the nuclear size varies a great deal. The

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nuclei of the cancer cell stain much more deeply than those of the foreign body giant cells. In the malignant giant cell the nuclei usually fill the entire cell so that only a thin rim of cytoplasm remains visible. The difference between the two types of cell can be readily seen in a comparison of Figure 3 which demonstrates a foreign body giant cell and Figure 4 which demonstrates a malignant giant cell.

A third type which leads to confusion is the small single histiocyte without ingested material. These cells often occur in groups and are then apt to be mistaken for undifferentiated cancer cells. Figure 5 shows such a group. Occasionally a group is found which is phagocytosing an epithelial cell and in this instance it is easy to classify such cells as histiocytes. Other groups are much more difficult to interpret. There are three criteria



for differentiating small histiocytes from cancer cells. The most important one is that the small histiocytes have a foamy vacuolated cytoplasm which is absent in the malignant cell. Second the nuclei of the histiocytes do not vary markedly in size and finally the entire cell is smaller than the undifferentiated cancer cell. Compare Figure 5 with Figure 6. In 2 cases in the negative group false positive diagnoses were made because of the pres-

ence of normal endometrial cells which were mistaken for cancer cells. The reason the endometrial cell prove troublesome is that their nuclei are hyperchromatic and there is very little cytoplasm. Since malignant cells have hyperchromatic nuclei and little cytoplasm the reason for the difficulty is readily seen. However the cytologist should remember that nuclei of undifferentiated malignant cells vary a great deal in size. This is not true

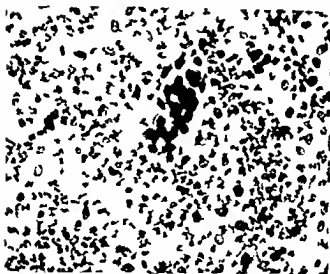
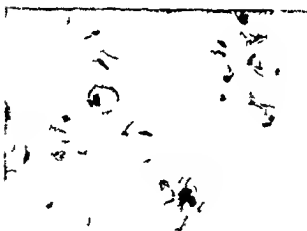


Fig 7 Sm h w i g g r p f b e r r a t t b l l t h t
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F 8 Sm F a f t d m n t t f l b e t l

of the endometrial cell where the nuclear size variation is small. It is important to remember that when there is bleeding from the endometrium normal endometrial cells are often encountered.

Another type of cell which has caused some confusion is the atrophic cell of the basal layer of the vagina. When a vaginal smear is composed entirely of basal cells aberrant forms are often encountered which are not

easy to classify. These cells account for 8 mistakes in the group of negative called positive. We have found that a satisfactory solution to this problem is to change the vaginal epithelium from atrophic to cornified by the administration of stilbestrol (1 mgm per day for 10 days) as originally suggested by Lapatincolaou. The basal cells will be completely replaced by cornified cells and at the end of the stilbestrol treatment the confusion atrophic

cell will have disappeared. A comparison of Figure 7 and Figure 8 represents this change.

The 7 remaining mistakes in the negative called positive represent smears which on re-examination still show in our opinion malignant cells. Two of these women have had hysterectomies for fibroids and no cancer was found. The remaining 5 have had biopsies only and in 1 case the biopsy specimen was unsatisfactory. We have no explanation for this discrepancy other than to postulate that perhaps a small tumor may have been missed at the pathological examination. In our previous paper we reported a case in which no cancer was found by the pathologist on routine examination but cancer was demonstrated after many subsequent sections were cut and examined. Te Linde in a discussion of this very problem reports 11 cases of early cervical cancer. He says: "In approximately half of the cases several well trained gynecological pathologists were unwilling to make the diagnosis of cancer from the changes noted in biopsy specimens. In all instances [after operation] the entire cervix was cut into blocks and in many cases much careful searching had to be done before an area of actual invasion was found."

DISCUSSION OF CASES

To illustrate the value of the vaginal smear in the early diagnosis of cancer we are abstracting 8 cases diagnosed primarily by vaginal smear. Two cases represent endometrial cancer, 5 cervical and of the 5 cervical cancers 3 are carcinomas *in situ* of the cervix.

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These cases illustrate that the vaginal smear is of great value in the discovery of unsuspected cancer. In 5 of the cases the cancer was not recognized although it was in that portion of the cervix which could be easily visualized. In 2 (the carcinomas *in situ*) the biopsies did not establish a diagnosis. The case in which both pyometrium and carcinoma of the endometrium were present is an excellent example of the aid the vaginal smear may render in establishing a diagnosis of cancer.

The case with carcinoma of the endocervix presents a special problem. If a woman has an early symptomatic tumor in that region mere vaginal examination of the cervix will not rule out the presence of carcinoma. This is true of course also in the endometrial carcinomas. By the time symptoms appear the tumor may have advanced to a stage where it is incurable. A vaginal smear may disclose the presence of such tumors in an early stage.

DISCUSSION

For the diagnosis of uterine cancer inspection and palpation have been found to have obvious limitation. For this reason various

aid to earlier diagnosis have been suggested. In 1931 Schuller advocated painting the cervix with a solution of iodine. The normal tissue of the cervix stains dark brown because of the glycogen content of the cell. Because of the lack of glycogen in leucoplakia and cancer the cells stain very lightly or not at all. Unfortunately erosions and inflammation also take the stain to a very limited degree so the picture may be confusing. The greatest value of the Schuller test is that it indicates those portions of the cervix from which the biopsy should be taken.

Another method proposed for early diagnosis is the colposcope developed by Hinselmann. The colposcope has been found to be of little practical value in examining large numbers of women not because of any error inherent in the method but because of the gynecologists' unfamiliarity with the magnified cervix.

The most important method is the biopsy. It establishes the diagnosis. However the biopsy is not infallible. It must be taken in that portion of the cervix where tumor is present. If the tumor is clearly visible the site of the biopsy may be easily determined. The chances of missing the tumor if the cervix merely presents a suspicious appearance are greater. Two of our cases of carcinoma of the cervix *in situ* were not demonstrated by biopsy though one was reported as carcinoma *in situ* and the subsequent negative biopsy was taken as near the same site as possible. Davis reports that in a study of 1200 cervical biopsies 238 sections showed no squamous epithelium and 300 were without gland tissue. It is evident that even assuming the most accurate histological diagnosis the efficiency of the biopsy in this group was only 75 per cent. It is perhaps important to note that in our 1,559 smears only 14 smears were unsatisfactory for purposes of diagnosis. Biopsy moreover requires certain operative facilities and it is not practical to carry it out on a large series of patients not suspected of cancer. A method which can be accomplished more easily and still accurate would be a

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great aid in early diagnosis. We believe that the vaginal smear represents such a method. We certainly do not feel that it should replace biopsy but rather that it is a very valuable adjunct to biopsy. Its advantages are: It can be carried out on a much larger group of women due to the ease with which a specimen may be obtained. It does not require special facilities. Any doctor in his office may take a vaginal smear and send it to a central laboratory where it can be examined by technicians trained in the method. The region examined is not limited by the size of the sample taken; the smear takes a fair sample of all cells desquamated into the vaginal secretion. It is not an expensive method.

The vaginal smear has the disadvantage that it does not show the grade of malignancy; moreover in some instances it is impossible to say from the study of the cells desquamated into the secretion whether the cancer is cervical or endometrial.

CONCLUSIONS

1. The vaginal smear technique is an accurate method of diagnosis of cancer of the uterus.

2. Vaginal smear and biopsy are complementary techniques which used together will enhance the effectiveness of the diagnostic clinic.

3. The most important contribution of the vaginal smear technique may be in cancer

control. Large numbers of women may be screened and those with positive smears studied further by biopsy.

4. We do not regard a negative smear as excluding cancer nor do we regard a positive smear without biopsy corroboration as an indication for surgery.

SUMMARY

We have presented 1015 cases studied by vaginal smear with a diagnostic error of 4.0 per cent. Difficulties in diagnosis are discussed. The accuracy of the method is emphasized. Mistakes are evaluated. Eight early cases of uterine cancer demonstrated primary by vaginal smear are discussed. The value of the method for cancer control is suggested.

Our statistics have been reviewed by Dr Herbert Lombard of the Massachusetts Department of Public Health.

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THE OPERATIVE TECHNIQUE OF COMPLICATED VESICOVAGINAL AND URETHROVESICOVAGINAL FISTULAS

S. N. HAYES OBE FRCS FRCOG L. T. C. I. I. M. S. L. h. I. d.

THERE is a general impression fostered by the reiterated statements of textbooks that to cure a vesicovaginal fistula requires a superlative degree of skill and a large number of special instruments. It is true that quite a number of fistulas we see have been operated upon by others. Masson and Wilson 1941 report 9 out of 48 cases had 90 operations or more than 3 per patient. Even so it must be realized that to attain a high degree of skill at any operation requires practice and as vesicovaginal fistulas are not common it is not possible for the average operator to obtain the necessary practice and knowledge of the various types of complications. The literature though extensive is not sufficiently detailed. This article summarizing 16 years experience is written with the object of assisting the intermittent operator as our opinion is that provided the operator has a good theoretical knowledge of the various technical details and complications he will obtain good results.

With this object in view 3 types of complicated fistulas have been illustrated to indicate the detail of technique (1) lateral type (Fig. 1, 3 and 4) Adherent to the descending ramus of the pubis (and usually associated with partial destruction of the urethra) (2) type with the upper portion of the urethra involved and which requires reconstruction (3) large fistulas.

All operations have been by the vaginal route (flap-plugging type) first described by Collis (1861) later by Lawson Tate (1889) and extended by Mackenrodt (1894). Reference is invited to the detailed review of the literature and bibliography by Naguib Pacha Mahfouz (1938). To him and to all other writers on the subject we offer our acknowledgments and appreciation.

TYPES OF FISTULAS AND PRELIMINARY STUDY

A careful preliminary study of the fistula is essential. Simple fistulas involving the bladder and free from or with slight fibrosis are easily cured by adopting the principles to be described. Complicated fistulas present greater difficulties owing to their varied nature as a result of destruction of tissue and resulting fibrosis. Rarely are two the same. Any or all of the following complications may be present.

Stenosis of the vagina in all degrees the most severe being when the normal vaginal wall are replaced by rigid fibrous tissue and the orifice admits one finger or partial stenosis the result of patchy fibrosis may be present.

Fibrous bands The commonest type is a transverse band at the junction of the upper and middle third of the vagina causing an hour glass contraction in the upper portion of which is the cervix and often the obscured fistula. The consistency of the band is frequently of cartilaginous consistency.

The site of the fistula varies from pinpoint to the whole vault of the vagina in which case the bladder is prolapsed. The shape varies considerably and is governed by the site and amount of fibrous tissue. A common type is a transverse oval one or both ends being fixed by fibrous tissue to the ramus of the pubis. The position of a fistula is not constant. It may be central and easily accessible or high up behind the symphysis. A common and difficult site is high and distant appearing from slightly laterally and behind the descending ramus of the pubis to which it is adherent.

Mobility of the cervix is often impaired and in some cases the cervix is completely immobilized by a solid mass of fibrous tissue thus considerably increasing the difficulties of obtaining a good exposure. The fistula may be completely immobilized and attached to one or both descending ramus of the pubis or to the posterior surface of the symphysis or it may be in the centre of a mass of fibrous tissue.

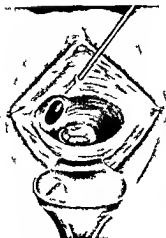


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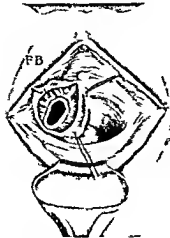


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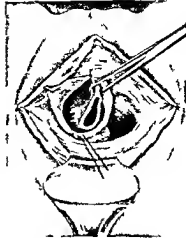


Fig 3

Fig 1 Lateral fistula descending from the urethra to the vagina. Fig 2 Fibroblastic fistula descending from the urethra to the vagina. Fig 3 Fibroblastic fistula descending from the urethra to the vagina.



Fig 4

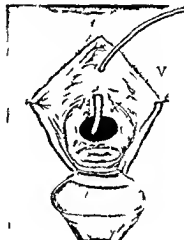


Fig 5

Fig 4 The fistula is located in the upper part of the urethra. Fig 5 The fistula is located in the lower part of the urethra.

Finally the urethra may have been destroyed in part or rarer (2 cases) in its entirety. In an average complicated fistula half the urethra is absent to be considered later. The upper urethra may be occluded by fibrosis.

Careful preoperative study of these many points will be well repaid and during this

study a plan of operation should be prepared. If necessary the patient should be anesthetized.

ONE OR TWO STAGE OPERATION

The large majority of fistulas can be cured by one operation (of 83 operations 78 were one stage). With large fistulas a two stage

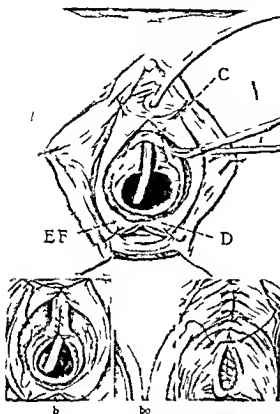


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operation based on reducing the size of the fistula: worth considering e.g. Case 392/42

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R ult c r d

We are very favorably impressed with deliberate two stage operations for large fistulas. As the urethra is usually partially absent care should be taken to confine the first operation entirely to the reduction in size of the bladder fistula and thus reduce the formation of fibrous tissue in the urethral area.

PREOPERATIVE TREATMENT AND PREPARATION OF THE PATIENT

Cystitis is treated by irrigating the bladder and vagina twice daily with normal saline of a temperature not higher than 100 degrees F. If hotter than this a local hyperemia is produced which increases oozing at operation. Excoriations of the vulva and thighs are treated by sitz baths followed by an ointment of equal parts of zinc oxide and lanoline. A mild aperient is given the night before and an enema on the day of operation. The operative area is shaved in the ward and prepared on the operation table by thorough washing with either ether soap or soap and water—the area being irrigated at the same time with sterile water. The area is then dried with cotton wool and painted lightly with tincture of iodine or other antiseptic. We have abandoned the use of drugs said to be urinary antiseptics.

THE OPERATION

Instruments. The special instruments used consist of (1) Irwin Moore's cleft palate scissors—curved on the flat. The cutting edges being $1\frac{1}{4}$ inches long and the points specially ground to a long bevel. (2) Long tonsil dissecting forceps—one pair with and one without teeth. (3) angular nasal forceps (Luc's) for swabbing. (4) Mayo's round bodied needles No. 18 with No. 0000 or No. 00 catgut for closing the fistula and No. 1 with No. 1 catgut for the vaginal mucosa. (5) Bozeman's needle holder. (6) a sharp pointed cataract or any small sharp pointed knife. (7) a standard set of gynecological instruments.

We have found no use for the large variety of special scissors, knives etc. devised for fistula work. The simple instruments here described have sufficed for all purposes. Retractors (except perineal) are rarely used as they obscure the vision.

Position of the patient during operation and exposure of fistula. The correct sitting of the patient and operator in order to provide the maximum exposure is of first importance and requires care. Shoulder rests are fixed to the table and the patient is placed in the lithotomy position. The operator sits as low as possible on an adjustable stool. The table is now raised and tilted and the buttocks are raised to a

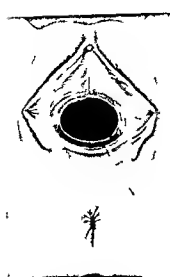


Fig 7

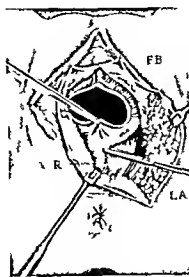


Fig 8

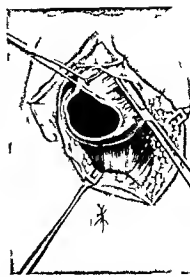


Fig 9

Fig 7 Sch hadt n (h l d be l t l) FB Th f t l be g p l d f m th clum R
 Fig 8 f l l to L f l l to
 Fig 9 Th b b d h l d be t th b l d d
 hu h bec t f say Fb l d be se pos bl d t l l t l d N t th free m b l y

height and inclination that provide the best possible exposure of the fistula. The resultant position is usually with the patient at 15 degrees and the vulva at about eye level. Adjustments are made as required during the operation. A good head light is essential. The labia minora are retracted laterally by suturing them to the inner portion of the thighs, the sterile sheet being included in the sutures.

In the majority of complicated cases it will be necessary to provide for additional exposure by means of Schuchardt's incision which can be made on the left or right but more commonly on the left side. The left forefinger is inserted into the vagina and the posterior wall is depressed toward the anus. This safeguards the anal canal and stretches the labium. Cutting laterally the operator makes an incision in the left labium at the junction of the middle and lower thirds. This incision is continued upward through the vaginal mucosa and on the posterolateral wall (still cutting outward) as high as is necessary. Externally it is carried downward in a curve with the convexity outward to a point midway between the tubercle and the anus. The incision can be deepened as much as is required and if necessary the levator ani

divided. By means of this incision the vagina can be turned into the shape of a wide funnel with the fistula at the top and excellent exposure is obtained. Double incisions (right and left) are rarely needed. A modification of the incision (Hayes 1937) has been described which enables skin flaps to be fashioned and turned into the vagina for the treatment of stenosis of the vagina.

Figures 7, 8, and 9 illustrate Schuchardt's incision (the beginning of which is too medial) used to overcome stenosis caused by a transverse fibrous ridge in the vagina and indicates the exposure obtained.

Hemorrhage during operation is usually considerable. Infiltration of the operation area with adrenalin 5 minims to 1 ounce reduces the amount of oozing. No attempt at hemostasis by means of forceps and ligature is made. Any visible bleeding point is controlled by underpinning with needle and catgut. Oozing and moderate bleeding are disregarded. The first assistant constantly places gauze swabs of suitable size in the vagina which the operator uses and discards. Time should not be wasted in endeavoring to check any bleeding which does not come from a spurting vessel.

The principles and steps of operation In order to clarify the technique described illustrations of 3 types of complicated fistulas drawn from sketches made during operations are shown. It should be noted that even with perfect exposure fistulas are not so near the surface as the artist for technical reasons depicts. They should be visualized as being inside and not outside the vagina so much so that in some cases the operator is working very high up at the end of his instruments and by touch.

1. *Incision of aginal mucous membrane and exposure of the fistula or urethra or both* (Figs 1, 3, 7 dotted lines). It will be noted that the edges of the fistula are not pared as if so the bladder is liable to retract and postoperative hemorrhage may result. In 2 cases excision of the edge of the fistula resulted in postoperative hemorrhage and the bladder was completely filled with blood clot. With the present technique no such complication has occurred. The first cut around the fistula is made about 1/4 inch from the edge with the object of marking out the incision. Joining this an incision over the urethra and one toward the cervix are then made. The incision is deepened to the connective tissue plane over the bladder and urethra by holding the vaginal mucous membrane with toothed forceps and cutting with the curved scissors. When the connective tissue plane has been entered the fistula edge is held posteriorly the lower blade of the scissors is slipped in and by cutting anteriorly on both sides in the incision line the vaginal mucosa on both sides is separated up to the incision over the urethra. The vaginal mucosa is next separated from the urethra by cutting with scissors and blunt dissection. The resulting right and left flaps are now freed widely by holding the flaps with toothed forceps and by scissor dissection. The flaps are then adjusted and sutured to the labia minora well out of the way and in a position that will give the best exposure of underlying structures. This provides for permanent retraction. It is advantageous to make the incisions as long as possible.

Mobilization As sutures under tension will cause edema and eventually cut through free mobilization of the part to be sutured

must always be the object in new Figures 3 and 9 viewed by holding them at eye level and at an angle of 45 degrees indicate what is meant by free mobilization. In both these cases there were dense adhesions holding the fistulas immobile. After mobilization any portion of the fistulas could be freely moved in any direction. The edges were easily approximated and suture could be performed without tension. The ideal to aim for is to be able to seize any portion of the fistula with forceps and pull it in any direction with absolute or moderate freedom. While this ideal may not in every case be attained it should always be aimed for.

Immobilization is produced by fibrosis which as stated may vary from simple fibrous band to sheets of fibrous tissue of cartilaginous hardness. Whatever the type and degree of fibrosis present free mobilization can be secured only by cutting through any obstructions with the curved scissors or breaking them down with the first finger.

Before adhesions are cut or broken down it is important to orient the position of the bladder by means of a curved probe or the first finger. This will obviate a traumatic perforation particularly when operating on large fistulas.

Fibrous bands and tissue (Figs 2 FB and 8 FB) are palpated by the first finger and then cut. It will often be found that after cutting the superficial adhesions deeper and denser bands firmly uniting the fistula to the descending ramus and symphysis remain. Very often they can be freed from the bone by using the index finger or by palpating with the tip of the scissor and then cutting. Although we prefer palpation and cutting with the scissors if free mobility does not result we have no hesitation in utilizing the first finger with considerable force to break down any connections between the bladder urethra and the posterior surface of the symphysis pubis and descending ramus. Figures 8 and 9 illustrate fibrous band in situ and being cut to provide the necessary mobility.

When the urethra is destroyed special treatment is required in regard to mobilization and in dealing with these cases it is advisable to consider (1) The urethra is a tube for the

conduction of urine from the bladder. Large portions of it can be destroyed but if the remainder can be joined to the bladder perfect function results even if the normal length of the urethra is not restored. (2) Providing one third inch of urethra is available satisfactory reconstruction can be effected. When the upper portion of the urethra is destroyed the remaining portion contracts. After it is completely mobilized it can be elongated to approximately double its length. Even a small fragment of urethra is of value and can be utilized. (3) A successful result will depend on (a) careful planning of the incision (b) special mobilization and (c) suturing.

The description of an actual case will clarify the various points.

CASE 7/3. I at t as a sept para ha g h d 6 n rmal d the 7th a ab m l d h ery ith baby b m l a l f l l d by incontinence C tract d utlet T to h Opn ti a p f m d Ma ch 93 th ugh a l f t Sch h r t i c t p u e as 100 ac u t f the arr b p u c a g l e Th t t l h g h a i b h d d y m p h y s d m t t h n d x f g I t h d d f t h r t h d t r y l a n d t h b l l i l d d l e c i o n a s m a l a c c l g h d t t l l e l g u r e 5 A r u b b r e t h e t h a l b n j a s s l t h u g h t h r m t s f t h u t h r a t t h e b l l Th m l d l t h l a s s n l y g t h m i g p t f t h d t r l u t h r a t h d g o f h c h e c l a y h f r d c j t e j r p o l y l p r a c t e t h d g l n t b s e n i f m t h c a t h t r t h d t t d l i e s o b o t h l e s w l l b m o o t h t N t h t t h i o p l n e d s u c h m e t h t t h e m o o t h t u n b t u r d b y t r a c t u t e v t h c a t h t r (F g 6 b) t h t r u c t g t h t h a Th g h t a d l f t r m l f l r e t h r f t l n l t u e d t t h l b m a (F g 6 a I I) Th t t c t p t n f t h u r t h r a s t h m b l d p t t h t r n a l m t h b l t l c u n t l t r l n l p t i r f Th d g f m b i z a t f a u t h u a t h t h a m u t f t h r m i g I t m a y h t h u t h l g b r y l y t m b f t l y l l t r l l y I t h t e l a r c a p l t m l l z a t a c r v W h t h c m p l t l t h e s o r s c l d b e p l f m l t t h e n l p t t h t f t h a n F g 6 a C Th t t t l c u t t h a a t r m l t t h d t t l l l g 6 Th d c t t i g e r y i d r t h t t t m d a l t t l t t l l m a y b u t l d t h t Th c o r s h b g g t d c t l t m c o t t b g t h t p h g p a l t t f t h d p l f t h m l e d t h l f u t t g t l

both desa d f ally d p t t h e t i u e n h i c h t h catheter was eated The b l d e r t h n m o b l i z l The c u l t a a f r l y m b l d u r t h r a d b l a d d a d j g t h e t o a p e c e e of t i s s u e h i c h a s t f r m t h e u p p o r t i o n o f t h e t h A v e r t i c a l L m b t s t r w a s t h e e r t e d c m m c g a t C o n t h e s i d e o f t h e u r e t h r a a n d i n c l u d i n g t h e t o e d g e s f t h t t f r m t h e t a n d l a t e r a l p o r t i o n s o f t h e r e c o n s t r u c t e d u r e t h r a t h e o t h b l a d d e a l f a d n d n g a t D F i g u r e 6 F i g u r e 6 b s h o s t h e s u t u r e p a s s i n g f r m c m p l t d u t h r a o n t h e b l a d d w a l l A s e c o n d s u p p o r t g L e m b t s u t u e a s t h e n i s e r t e d P l a t n s s u t u r e s v r e s r t e d t h b l a d d r u (F i g 4) T h e r e i n r t e d u n t l t h e c a t h e t r w a s a t l g h t f t T h e a g n a l m u c o s a v a s t h e l s e d (F i g 6 c)

3 Suture The object of suturing is to make a watertight joint and much depends on the care with which suture particularly the first are applied. Patience and accuracy are essential and if the operator is not satisfied that he has the correct portion of tissue on the needle another attempt should be made. The same accuracy should be aimed for as in an intestinal anastomosis and as the working space is often confined a considerable amount of maneuvering is often required. Around a fistula is an area of fibrosis and this area which is tough and strong should—with as much other tissue as possible—be included in the first suture.

As the edges of a fistula are not excised edge to edge suturing is valueless. The edges must always be inverted with the forceps before the necessary tissue is picked up with the needle.

The standard suture is placed vertically as by this means it is easier to reduce the lumen of a dilated urethra and to plicate the bladder in the region of the new internal sphincter (Fig 4). In irregularly shaped fistulas the sutures have to be placed in the most convenient position. It may be necessary to suture transversely or diagonally and on one occasion a triradiate suture was necessary. Every effort should be made to insert a second Lembert suture or to cover and reinforce the first suture line with borrowed tissue. If this cannot be done the need for the careful incision of the first suture is even more apparent. In high oval fistulas adherent to the ramus of the pubis it is advisable to use two sutures and insert suture each angle gradually.

working toward the center where the sutures are tied

LARGE FISTULAS

The size of a fistula is no criterion of its curability. In many cases a large two finger fistula is easier to cure than the small adherent type (Figs 73 and 9)

CASE 46/39. Patient suffered from continuous rolling birth of a dead baby after 3 days labor. She had had a previous operation. Operation was performed May 9, 1939 through a Schuchardt incision. The fistula admitted fingers with high and the symphyseal distance led to the left and right. The upper two thirds of the urethra were destroyed. Mobilization of bladder in preparation of many degrees and fibrous bands between the symphysis and the bladder to both descending rectum and uterus and ovaries absent. No vaginal or cervical lacerations. The bladder was plicated to provide cover for the bladder posteriorly or vaginally. It was firmly separated from the rectum and uterus. Results were excellent.

The accompanying illustrations depict clearly (1) Schuchardt's incision and resulting excellent exposure (2) the free mobilization resulting from thorough freeing of adhesions (3) that large fistulas can be cured if extensive dissection is made.

The internal sphincter and large fistulas. The question will arise—How is sphincteric control resumed after operations on bladder fistulas of large size (1 to 3 fingers) and due to the destruction of a large amount of tissue? The answer is that provided the fistula can be closed and the area at the junction of the urethra and bladder reduced to an optimum size sphincteric control will result. We invariably insert a No. 8 rubber catheter before or after closure of the fistula. Plication sutures in the region of the bladder urethra area are then inserted until a fairly tight fit is obtained. If it is deemed necessary the urethra is then plicated.

CLOSURE OF THE VAGINAL MUCOSA AND PACKING

Interrupted sutures are inserted and if ooze is excessive a small piece of rubber glove is inserted for 4 hours. The vagina is then tightly packed with gauze which is removed after 8 hours.

POSTOPERATIVE TREATMENT

The careful attention to detail is as important as the detail of operation. There are two principles to observe, namely (1) to keep the bladder empty and (2) to keep the stitches clean.

Bladder. We have utilized various mechanical and water pumps for the purpose of keeping the bladder empty and also suprapubic drainage and nursing the patient on the face. None has been completely successful. Such measures require constant and expert supervision. An indwelling catheter connected to a bottle tied to the side of the bed or placed in a bottle between the patient's legs has given us the best results.

Stitches. The vaginal packing is removed after 8 hours and nothing more is done for 3 days—after which and once daily a small bivalve or posterior speculum is inserted into the vagina and the stitch line is exposed—the patient being in Sims position. The stitch line is then thoroughly syringed with normal saline. A 10 cubic centimeter syringe fitted with an intramuscular needle being used. This method enables the stitch area to be very thoroughly cleaned and is far superior to douching. The vagina is dried with cotton wool and painted with acriflavine and glycerine. Stitches which show signs of infection are removed and the remains or all stitches are removed by the 8th day.

Even when the wound breaks down the regular and methodical cleansing described should be continued and the catheter retained for at least 21 days. A number of our wounds have broken down but with such treatment have eventually healed. Even if this does not happen a clean wound has less resultant fibrosis than a dirty one and a second operation is therefore easier.

If union is good the catheter which is removed daily—cleansed, boiled and replaced—for 10 to 12 days is then removed for periods of 4 hours daily. These periods are increased daily and when the patient is able to retain urine during the whole day the catheter is completely removed. The stay in bed averages 21 days. The catheter is kept in the bladder during the night until daily bladder control is obtained.

nosis bad and the result has been a perfect cure and *vice versa*

amination but invariably make one or more attempts at closure

CASE 26/44 Cicatrization of a high degree of stenosis of the uterine neck. A patient with a history of abortion and a history of a difficult labor. On the 26th of July 1944 the patient was operated on and the result was a perfect cure.

This experience has been fairly common and we now do not as es operability by ex

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SAPHENOFEMORAL LIGATION WITH THE IMMEDIATE RETROGRADE INJECTION

H O McPHEETERS M D F A C S M n n e p o l s M s t

THE purpose of this paper is to discuss the treatment of varicose veins of the lower extremities by means of preliminary ligation of the offending veins together with either the immediate or subsequent injections of the sclerosing solution.

The discussion is based on an experience gained while doing and caring for 238 ligations in 1952 patients. Of this total number 633 were bilateral ligations. There were 89 cases in which the short or lesser saphenous was ligated. Females predominated 3 to 1. 1904 females to 678 males. This preponderance of females is explained by the fact that many women come for treatment for cosmetic reasons only, while most men come only when the pain and ache in the leg is severe or when a definite thrombophlebitis has developed. When the varicose condition involves only one leg it shows no predilection for either—right 1307 left 1275.

As to age groups we found the large number of cases in the decade between 50 to 60 years 33 per cent with the next in the 40 to 50 year group 30.6 per cent. 13 patients were under 20 years 7 per cent. 49 patients 70 to 80 years old 2.9 per cent and 1 patient was 81 years old.

The normal upward venous flow is carried on by three main factors. First the pressure of the arterial blood through the capillaries and into the veins, second the pumping effect of the calf muscles as they contract on the deep veins while the patient is walking, third the suction force of respiration which causes a negative pressure in the chest during inspiration.

The theory that the preliminary ligation is the first and perhaps the most essential step in the treatment is based on the now proved fact that the flow of blood in any well developed case of varicose vein is actually *retrograde*; that is, it is flowing downward toward the foot

instead of toward the heart as should be the case with all venous blood. The more marked and well developed this flow has become the more important it is that the ligation be the first step in the treatment.

The reverse flow of the blood develops because of the loss of function of the valves in the veins in the thigh and lower leg. There are usually 5 to 7 sets in the great saphenous through the thigh with one set just outside the saphenofemoral junction and at times one set in the deep femoral and iliac vein just above. There are several sets in the veins of the lower leg.

The loss of valve function develops for several reasons. First and I believe foremost a hereditary factor is present in fully 50 per cent of the cases. By this I mean the patient is born with a weaker than normal set of vein wall through some sections. Under the stress of normal life, exercise, work with its attendant straining and the increase of intra-abdominal pressure etc. these vein walls stretch and give way so that the vein lumen may become several times larger than normal. Thus the valves will be mere cusps on the side of the vein wall and of little value. Careful taking of histories has often shown this to be the case. The second most common cause is infections. During sickness there has actually been a bacteriemia with the infection causing damage to the valves and scattered areas of the vein wall. The weakened wall dilates under the usual venous pressure and then more rapidly later when the valve function is lost. The third most common cause is pregnancy (10). Many have argued that the growth of the uterus mechanically causes pressure on the iliac veins and that the normal veins below just give way under this strain. This is not the usual case for the varicose veins most often begin during the first 3 months of pregnancy when the fundus is still small and freely movable in the pelvis. There is much evidence

to prove that there is actually a disturbance of the hormones (11) with an overdevelopment of some such as progesterone which permits the muscles of the vein walls to soften and stretch (10). Fourth there is the case of congenital varicose veins and the arteriovenous fistulas. These anomalies are recognized soon after birth or during the early months or years of life. They are most difficult to treat.

What varicose veins should be ligated? The patient with small varicose veins the size of a lead pencil with a very slight or no reverse flow can well be treated with simple injections. Any patient who does have a well developed reverse flow should be studied and then a ligation block should be made above that point wherever it may be. Many surgeons believe that any vein large enough to be injected should be ligated first. In my opinion this is too radical for with proper selection fine results have been obtained in many hundreds of cases over a period of years. Personally it would seem that any vein that has been injected with care and there has been a recurrence should be ligated. Any great saphenous 1 centimeter or larger in diameter at the saphenofemoral junction or the short saphenous the same size at its junction with the popliteal vein should be ligated. Any vein with a definite reverse flow through a perforating vein and which does not come from the saphenofemoral junction should be ligated where found. The possibility of the presence of compensatory dilated veins must always be thought of and especially so after a history of phlebitis. Compensatory veins may develop following a blockage of the deep system but after the deep veins heal and become recanalized and again are patent and functioning we should study the varicosities present and if they show the finding of typical varicose veins with a marked percussion pulse (14) PPT (Fig. 1) at the groin and a reverse flow they should be ligated and injected just the same as any other varicose vein in any individual.

The Trendelenburg (17) test is the one most commonly used to determine reverse flow (13). It is simple and easily done. With the patient standing the varicose condition is studied. The percussion pulse is followed along the

vein to the groin. The patient then lies down and the leg is elevated to empty the varicosities. Pressure is then made over the saphenofemoral junction to block any outward flow. The patient then stands. If there is a marked reverse flow from the groin when the pressure is suddenly released the empty varicosities will fill rapidly and the test is positive.

If the varicosities fill slowly with the normal accumulation of blood from the distal area but fill more rapidly when the pressure at the groin is released then the test is still positive. We also have the condition in which the reverse flow is outward through a perforating vein in the thigh or lower leg. In this case the vein will fill rapidly and not become more tense when the pressure above is removed. This is a negative test. Then there are cases which have some of the reverse outward and downward flow from both sources. This is called a Trendelenburg double test.

The Perthe test is the one most commonly used to locate a reverse flow through a perforating vein in the lower thigh. It is made by applying a rubber tube tourniquet about the leg and having the patient walk rapidly for 50 to 100 steps. The normal pumping effect of the calf muscles with each step will suck the blood inward from the varicosities and thus the varicose segments above the tourniquet will remain filled while those below will be emptied. If the test is positive the empty veins will quickly fill from above as the tourniquet is removed. The multiple tourniquet test of Oschner and Mahorner (9) is merely the reapplication of the Perthe test at different levels until the offending vein or veins are located. Gerald H. Pratt uses two bandages about the leg to locate the perforating vein. They work well. One bandage is applied very tightly from the foot to the groin. When the patient stands it is removed from the top down. A second bandage is then applied from the groin downward leaving about 4 inches between the bandages. In this way the perforating veins can be seen as they appear. If the test is negative and the large varicosities are compensatory veins then the veins below the tourniquet will enlarge as the patient walks rapidly and the patient will complain of pain in those areas and the lower leg.

The bandage test is the final proof as to whether the enlarged veins are varicose or compensatory. It should be used on all cases that are not clear with the other tests. Here a firm 4 inch bandage (the Ace No. 1 four inches wide has been found to be most satisfactory) is applied about the lower leg from the knee down to the toes going twice about the ankle and foot in a figure of eight. The patient is then told to walk four to five blocks very fast. If the patient should develop a pain in the lower leg and in particular if this should increase then he may remove the bandage but if the pain does not increase as the minutes go by then he should walk three blocks rest walk four blocks rest walk five blocks and then report back to the office for examination with the bandage still applied. If the pain should get better then he is to leave it on until bed time when it can be removed if uncomfortable. If the varicosities are compensatory the patient will have severe pains through the lower leg and foot when walking but if they are typical varicose veins with a stagnant and reverse flow the patient will feel better the faster he walks and when he returns after a fast ten block walk his toes will be pink the edematous leg will be much softer and the patient will admit that the leg feels better than it has for a long time. Many doctors do not grasp the mechanics of the compression bandage and the pumping effect of the calf muscles on walking. Many patients have actually been told never to wear a tight bandage on that leg. It is a common thing for a doctor to let the patient dominate the situation and when the patient says I do not like the bandage etc. he is permitted to go without the support even though the lower leg may be edematous and badly swollen. When the patient has had this kind of treatment in the past I admit that it is a case of salesman hip to persuade him even to try wearing a bandage on the lower leg long enough to make a good test let alone for treatment of an inflamed edematous leg with ulcerations. Again the doctor must decide whether there is evidence that the patient has pain or whether it is a case of fear on the part of the patient and lack of confidence in the present attending physician.

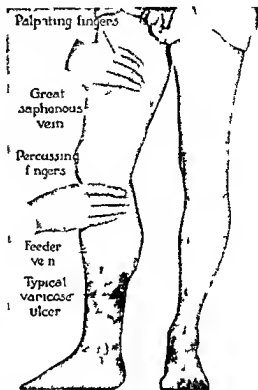


Fig. D m. tral g th pe cu p l t m t t l
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m t f l t tpe th gh d llem h d)

At the time of examination we must not only settle the question of the reverse flow and that a ligation or ligations should be done but we must not forget the patient himself. How often we see a patient die of shock from a burn while the doctor is meticulously caring for the burned area itself in order to avoid a later infection if the patient lives. So here we must always be on the lookout for a complicating diabetes for a cardiorenal condition and for the presence of a very toxic thyroid with the varicose veins by far a secondary factor.

The diabetic patient stand surgery poorly until he is insulinized the decompensated heart patient should be digitalized and then he will gain much relief from the care of the varicose veins. The worry and pain of bilateral ligation with an excessive reaction may

to prove that there is actually a disturbance of the hormone (11) with an overdevelopment of some such as progesterone which permits the muscles of the vein walls to soften and stretch (10). Fourth there is the case of congenital varicose veins and the arteriovenous fistulas. These anomalies are recognized soon after birth or during the early months or years of life. They are most difficult to treat.

What varicose veins should be ligated? The patient with small varicose veins the size of a lead pencil with a very slight or no reverse flow can well be treated with simple injections. Any patient who does have a well developed reverse flow should be studied and then a ligation block should be made above that point wherever it may be. Many surgeons believe that any vein large enough to be injected should be ligated first. In my opinion this is too radical for with proper selection fine results have been obtained in many hundreds of cases over a period of years. Peroneally it would seem that any vein that has been injected with care and there has been a recurrence should be ligated. Any great saphenous 1 centimeter or larger in diameter at the saphenofemoral junction or the short saphenous the same size at its junction with the popliteal vein should be ligated. Any vein with a definite reverse flow through a perforating vein and which does not come from the saphenofemoral junction should be ligated where found. The possibility of the presence of compensatory dilated veins must always be thought of and especially so after a history of phlebitis. Compensatory veins may develop following a blockage of the deep system but after the deep veins heal and become recanalized and again are patent and functioning we should study the varicosities present and if they show the findings of typical varicose veins with a marked percussion pulse (14) P P T (Fig. 1) at the groin and a reverse flow they should be ligated and injected just the same as any other varicose vein in any individual.

The Trendelenburg (17) test is the one most commonly used to determine reverse flow (13). It is simple and easily done. With the patient standing the varicose condition is studied. The percussion pulse is followed along the

vein to the groin. The patient then lies down and the leg is elevated to empty the varicosities. Pressure is then made over the saphenofemoral junction to block any outward flow. The patient then stands. If there is a marked reverse flow from the groin when the pressure is suddenly released the empty varicosities will fill rapidly and the test is positive.

If the varicosities fill slowly with the normal accumulation of blood from the distal area, but fill more rapidly when the pressure at the groin is released then the test is still positive. We also have the condition in which the reverse flow is outward through a perforating vein in the thigh or lower leg. In this case the vein will fill rapidly and not become more tense when the pressure above is removed. This is a negative test. Then there are cases which have some of the reverse outward and downward flow from both sources. This is called a Trendelenburg double test.

The Perthe test is the one most commonly used to locate a reverse flow through a perforating vein in the lower thigh. It is made by applying a rubber tube tourniquet about the leg and having the patient walk rapidly for 50 to 100 steps. The normal pumping effect of the calf muscles with each step will suck the blood inward from the varicosities and thus the varicose segments above the tourniquet will remain filled while those below will be emptied. If the test is positive the empty veins will quickly fill from above as the tourniquet is removed. The multiple tourniquet test of Oschner and Mahorner (9) is merely the reapplication of the Perthe test at different levels until the offending vein or veins are located. Gerald H. Pratt uses two bandages about the leg to locate the perforating vein. They work well. One bandage is applied very tightly from the foot to the groin. When the patient stands it is removed from the top down. A second bandage is then applied from the groin downward leaving about 4 inches between the bandages. In this way the perforating veins can be seen as they appear. If the test is negative and the large varicosities are compensatory veins then the veins below the tourniquet will enlarge as the patient walks rapidly and the patient will complain of pain in those areas and the lower leg.



Fig 1 ft \ tu lm k g l gth g t saph
 f g b eadh bel th l lf ld b l ci th gh
 th f sc l h th gth g t ph

mark is best made by a simple scratch with the back of the tip of a scalpel. If you warn the patient of it and do not press hard he will mind it but little. Additional marks are made lower in the thigh or lower leg if other ligitations are to be done there.

I preferably the leg should be draped epa- rately so that it may be raised high from the table without contamination. If bilateral li- gation is being done both legs are so draped. One per cent novocain is infiltrated through the area care being used to carry it widely enough to give good anesthesia.

After the skin and superficial fascia have been incised a secondary infiltration is made of the deeper layers. As the dissection is carried downward and about the saphenous vein injection should be made all o into the posterior sheath of the vein as soon as possible as the sheath carries nerves and the patient otherwise will complain. Two or 3 cubic centimeters of novocain is then injected about the vein just at the foramen. If care as to the injection is used the ligation can be done with little or no pain and with much surprise and pleasure on the part of the patient. As a rule about 90 cubic centimeters of novocain is used for each side.

The incision should be adequate about 3 inches longer in the oblique individual. As Ju lid (7) so aptly said incisions heal from side to side and not end to end. A short incision predisposes to incomplete work and makes the chances for technical complications far greater.

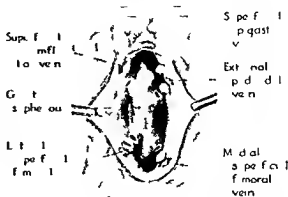


Fig 3 F sc l h th h s bee pe ed d stripped ff
 Th g t ph d llb hesh bee lg led sep tly Th
 g t ph d dy t be l imp d

It is these avoidable complications that cause calamities in this work and we should try to prevent them.

Dissection carried out directly down and under the preoperative scratch mark will reveal the vein. The vein can also be located just internal to the pulsations of the femoral artery or in the soft triangle between the heads of the sartorius and the adductor longus muscles. It is very simple to open the sheath and to peel it off the vein. The peeling process should be done from inside the sheath and more novocain should be injected as the sheath is peeled off (Fig 2 and 3).

As a rule the vein is found about 2 inches below the saphenofemoral junction. During the dissection stage it is important not to use forceps with teeth as so often the vein wall is thin and is easily torn. The vein is lifted up and a curved Mixter cystic duct clamp is slipped under it. A clamp is then placed on the vein distally and the curved clamp proximally. The vein is sectioned a stump one half to three quarters inch being left on the distal end. This stump will facilitate the injections later.

The fat is retracted upward and the proximal stump is followed to the wall of the femoral vein. All branches are carefully located. This is very important and the dissection must be carried upward and into the foramen so that the femoral vein can be seen both above and below. Often times branches come off directly at the foramen (3, 12) (Fig 4). Usually



Fig 4 G t saph t u ed th lumps both
p xim l d d i t a l d \ t th in b tary t n
th saph in th f ram Ea h p t ty lig t ed
Ad bl ligat bo t th p ximal tump th fl f
th f m ral A p r s t r i g l a l r e h a b e p l a c e d
t u n f th f m th tump i s t c k e d u n Th
t m a l p d d l t r y l e s b e l w t h f m i n b o t
o o p e t f t h c a s e s

there are three branches in the last one half inch of the saphenous vein. No 40 cotton is used for these ligations. The presence of the small external pudendal artery is a good landmark as to the location of the foramen. The artery lies just below or above the saphenous vein at the level of the foramen and often may be double going both above and below. It should be ligated if it is in the way.

The femoral artery with its pulsation is located just external and can easily be injured with careless clamping of the artery. Often when the clamp or ligature slips off the proximal vein stump profuse hemorrhage develops. In most instances amputation following ligation has been the direct result of this injury from clamp or forceps with resultant thrombus formation and arterial blockage. This statement is made after autopsy in 2 cases and after careful study of case histories from attending surgeons in several other cases.

A No 16 cotton ligature is placed about the proximal stump and fluffed with the wall of the femoral vein. A second ligature of No 16 cotton single is then tied about the same stump as a double precaution against post-

operative hemorrhage. I have had this experience. Some prefer to transect the vein. That is all right. I prefer to use the two separate ligatures and leave a longer stump of vein. In this way there is no proximal stump from which an embolus could come. At least three-fourths to one inch is left distal to the ligature thus eliminating worry about the ligature slipping off the end.

A pursestring ligature of No 16 cotton is placed about the foramen (Fig 5) so as to close the fat and fascia over it and thus to reinforce a weak spot in the fascial plane over the femoral vein the same as we would do with a femoral hernia. Most men do not bother with this step but I think it is just good surgery to reinforce a weak spot in the deep fascia. It just lessens the possibility of a recurrence through a small branch that may be left even with real care.

The distal stump of the vein is then picked up with small forceps. A No 16 cotton ligature is placed about the vein distal to the clamp. With the forceps on the vein stump in one hand a cannula on a syringe containing the sclerosing solution is then slipped into the open end of the vein. The clamp is removed and the ligature tied all at the same time.

The patient is then tipped into a marked Trendelenburg position and the foot and leg are raised high for about 1 minute so as to drain all the blood from the varicose veins through the communicating veins into the deep system. The table and patient are then quickly tilted into the reverse Trendelenburg position with the leg still held high. The leg is then quickly dropped to the table and two-thirds of the solution is injected. Since the varicose veins are now empty and collapsed the solution will drain down and spread widely through the branches to the calf and at times to the ankle. After 1 to 2 minutes the table is returned to about 10 degrees off the horizontal and the rest of the solution is injected. The wound is washed with normal saline to free it of any sclerosing solution that might have been pulled during the injections. It is then closed with two sutures of No 16 cotton and the skin with dermal Mestazol helps keep the dressing in place and furnishes a better protection.

As soon as the wound is dressed separate strips of adhesive are applied over the large segments of varices so that as the thrombus develops during the next 24 hours it will be kept as small as possible. A large thrombus will liquefy and recanalize while a small one will organize with a good result.

Immediately following the operation the patient must walk rapidly the equivalent of one block. He can then dress and go home but must walk 5 minutes out of every hour until 10:00 p.m. of the day of operation. He is given some sort of sedative capsules for the moderate pain he will have and told to take them as needed and to report to the office for a dressing 2 days later. That visit is very important for his comfort. If the reaction through the thigh is severe the thigh should be strapped with elastic adhesive for support. If severe in the lower leg then a firm 4 inch bandage from the knee to and about the foot will give much relief. Patient must continue to walk some every 3 to 4 hours during this time.

The sutures are removed at the end of a week and either then or at a later date the injections of the remaining patent varicose segments are begun. If the reaction has been severe there is no harm to wait until it has subsided. But it is very important that the follow up injections be continued until all the varices are firm and hard. Usually the injections are given every 1 or 2 weeks and 3 to 6 at a time. These are of $\frac{1}{4}$ to $\frac{1}{2}$ cubic centimeter of the same sclerosing solution. Immediately following each set of injections the patient must walk fast 3 to 5 blocks and then at frequent intervals all day long.

PREGNANCY AND LIGATION

The treatment of varicose veins during pregnancy except in the isolated case does not seem justifiable. At times much relief can be given by a few injections. During pregnancy the injection of the feeder vein into a large and rapidly forming burst is always indicated to relieve pain and to prevent the formation of this unsightly condition—a condition that cannot be completely cleared once it fully develops. The ligation of the varicose veins during pregnancy has been one hundred per

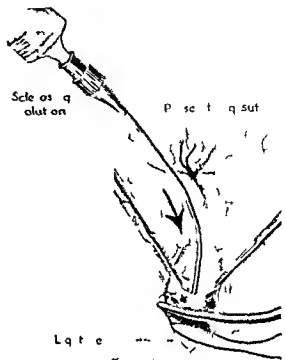


Fig. 1. Sclerosing solution injected into the P. saph. vein. The leg is then bandaged with L. g. t. e.

cent failure and is not recommended. These patients should be treated palliatively with the injection as indicated and they should wear a firm 4 inch ace bandage during the day and remove it at night.

COMPLICATIONS

Complications are best divided into those of the operation itself and those of the postoperative period.

The most common and serious complication that can and may develop during the operation is a hemorrhage. Hemorrhage may come from the tearing of a large dilated saccular thin walled vein during the dissection. It can best be avoided by not using forceps or clamp with teeth. Personally I am very careful that no such instruments are ever on the table. Another common cause of hemorrhage is the slipping of the forceps on the proximal stump during dissection or slipping of the ligature after it has been tied. The first

can happen to any surgeon but the latter can be avoided if the care already discussed when the ligatures are applied is exercised.

If the proximal stump does become loose either from a poor forcep or a slipped ligature where the vein is the size of the thumb the surgeon is faced with a real problem. The patient is usually nervous and straining. They sense that something has gone wrong and they become more worried and tense. The blood boils up from the bottom of the wound as from a spring. Here the potential source of calamity and the principal reason of a good operating room. The surgeon should keep calm and quickly place a large sponge in the wound with pressure and tip the table into a marked Trendelenburg position. Of course the shoulder supports have been applied as they always should be. The leg is raised straight up and the table, patient and leg are held in this position for minutes. It is surprising to find that after that length of time the leg can be lowered to the table, the pressure removed from the wound and there will be but little bleeding. The proximal stump is now carefully sponged and picked up and the operation continued. As soon as the stump has been reclaimed the table may be leveled again.

If a postoperative hemorrhage should develop after the patient leaves the hospital I would insist on his lying quiet while someone quickly places a clean towel over the area and maintains constant severe pressure until the patient can be taken by ambulance to the hospital and operating table. It should be remembered that pressure and bandage will stop any hemorrhage. The wound should be reopened and cared for as described.

CASE. A 40-year-old male patient, with a history of hypertension, was admitted to the hospital with a diagnosis of aortic aneurysm. The patient was in good health until a few days before admission when he began to experience severe back pain and weakness. On admission, the patient was found to have a large, pulsating mass in the abdominal region. The patient was taken to the operating room for exploratory laparotomy.

CASE. The patient was a 40-year-old male, with a history of hypertension, who was admitted to the hospital with a diagnosis of aortic aneurysm. The patient was in good health until a few days before admission when he began to experience severe back pain and weakness. On admission, the patient was found to have a large, pulsating mass in the abdominal region. The patient was taken to the operating room for exploratory laparotomy.

At the time of the operation, the femoral artery was found to be anormally entirely in front of the vein for 3 inches down the thigh. If the patient is very apathetic with a low blood pressure and thinned walled arteries with poor pulsation, it would be found in such a case it is possible for the surgeon not exercising proper care to ligate an anomalous profunda femoris branch of the femoral artery. I am sure that this was what was done in one case with a resultant slough of all the area of the lower leg supplied by this branch. The patient complained of severe pain through the leg and foot as the distal injection was made under local anesthesia. The operation was completed under gas anesthesia and the other side was ligated. The second side progressed as usual while after 2 years of hospitalization and litigation an amputation through the lower thigh was made of the first side.

Gangrene of an extremity can happen only from a loss of the arterial supply. Gangrene could not happen as a result of the retrograde injection at the time of the ligation as the injection is made into the returning side of the circulatory tree. The injected fluid could not get across into the arterial side by any conceivable route. It would seem that those who argue that it can do not reason out the route and direction of the blood flow in the arterial capillary and venous portions of the circulation. A knowledge of the blood pressure readings found in the different areas would prove the fallacy of the idea.

The greatest source of morbidity in this series as also with those patients seen after operation in consultation has been the severe chemical phlebitis and the associated cellulitis following the injections of too large amount of the sclerosing solution. By the use of the tilt technique described by the individual

re It su ly does r d ce the mo nt of venous bleed g at the t me of the ope t n The cl n cal e dre ult r f e d th p t n ts re urp is ngly comfo table aft oper ton

Aft uch n ten i cl n cal trip a d h ing cared fo and t at dov r f t n th sa d a co e n p t n ts n n hom o v 3056 e n l g t o n s ha e b n done I ha v etu ed t my form r ct on mor f m l y th n e B e f y st ted thes a follo s

COCLUSIO S

The es m n y ca e of v r co veins n tall e ct e n the m d v d al 2 V n y cas ar best expl i ed by c n g e n t l weak es r defic ncy of th e n w l l n scatt r i a as V n y have th s s me kness dev l f follo ng damag to th e i all d al es b v a phl b t

3 The hormo eth ry (to) as e us f ar cose ns must be mo e tho oughly xplo d d test d 4 The prese c f incompt t perf r t g r i m u n i c a t g v n s o n ca e of th cu e ce must be ecce t d Th ffo t of Homan (4) Pratt L ton O h e r (9) Sherrna and ther compet n m n m t b e c e d

5 Finally the g e t m a j r i t y of ca es ar b e t pl n d n the ba f deg n at e c n d i t i o n developing the ven w l l m l a r t the d ca c f te c t h th de l o p m n t f g v h r f l a t f e t h r format hemorrhoid t c O n th th r y c and m o s t e p e c t m o i c o s e s t f o r m a d d l p a s t h e y e a r s b y r e g r d l s f h n t h o g h the p e a t e m l m h a v e b o l n m y p e r o l e p e r i n e i c e e i n s h d e l o p e d n f t r t h b s t a n d m s t t h o u g h p e t i e p o c e d u r B u t j u s t a t h e d e t t w i l l c a f a n d r p a a s t f t e t h d l y n e g l c t e d t h r o u g h t h y r s a n d t h a t l l t h p a t i e t t o r t u r n e v e r y a t h a n c a u e f i l l e d h l e m l l o m u t t h e r g t r e a t

his p t t with r i c o s e H m u t d t best w o l k h e c a n f r the i n d u a l c a e t h a t u s n g t h e b s t r t h o i a d a p t b l a s e g r d t h r z i c a l p h a s e a d e m b e w t h t s m f m f t h e p e c t o n t r t m n t W h e n t h e r e s u l t s f e t h t p e n t i d c h a g e d w i t h t h e i n s t r u c t i o n s t h a t n r o s t i l l p o b a b l y f r m a t h e y e a r s g b a n d t h a t h s h o l d r t n e r y y e a t h a t h e s e c a r d f o r b y t h e m e t r u f a f e j c t i b l t h e r i c o s e v e a r s m a l l o t h t h f e s h o b t a i n d t h o u g h m u c h l a b r w l l b r e t a d

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- 4 H o m a J o h S g G y n O b i 9 6 43
- 5 I d m C u l a t r y D f t h E t r m t e s N
- 6 H T E W R R L C S E V i T O N D R 1
- 7 J c n E S P l m m t
- 8 L T O P R A n s g 933 7 53
- 9 M a r o E H R n d O E r 1 1 5 8
- 10 M C L A D A M C M W t M 939
- 11 I d m W e s t J S g 943 6 99-100
- 12 M c F I E T H O J L t 93 5 589
- 13 M c I n R A J A m M A s 93 96 4
- 14 M P u t s H O d L 90 J K I J t
- 15 P h u l d l p h i F A D C 939
- 16 P T T G R A L D H J A m M A s 94 7
- 17 S H E R M A R S T O A n s g 944 71
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ABSORBABLE FIBRIN SPONGE AND THROMBIN FOR HEMOSTASIS IN NEUROSURGERY

Experimental and Clinical Observations

COBB PILCHER M.D. F.A.C.S. and W. F. MEACHAM M.D. Nashville Tennessee

THE introduction by Ingraham and Bailey (2, 3, 4) of fibrin foam prepared from human blood as an absorbable medium for the application of human thrombin constituted an important advance in technical neurosurgery. Recently Correll and Wise have developed a foam like sponge whose essential ingredient is gelatin. When dry, this sponge can be cut into sheets or pledgets of any desired thickness and dimensions; it absorbs liquids readily and its tensile strength and other physical properties make it easy to handle without fragmentation in either the dry or wet state. It has the additional advantage of being produced from a readily available substance by a simple and inexpensive process.

The use of this sponge as a hemostatic agent in neurosurgery has been carefully investigated by Light and Prentice (5) in monkeys. They found that the gelatin sponge is readily absorbable and that it has no significant toxic or irritative effects. In these respects it was comparable to fibrin foam.

Subsequently Light (5) employed the gelatin sponge in conjunction with bovine thrombin in a series of human neurosurgical operations. As a hemostatic agent the sponge proved quite satisfactory and no harmful effects of any kind were noted.

We have carried out experiments on dogs in which the efficacy of gelatin sponge has been determined and its absorption and replacement have been studied histologically. In all experiments identical observations were made upon fibrin foam as a similar medium of already established value and safety.

Concomitantly gelatin sponge has been employed in a number of human neurosurgical operations by a group of neurosurgeons who have been kind enough to forward reports on these cases to us for analysis.

EXPERIMENTAL OBSERVATIONS

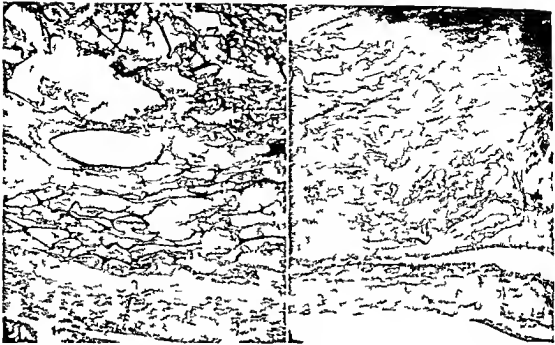
Identical procedures were carried out on all dogs with routine neurosurgical technique. Under intravenous nembutal anesthesia the superior longitudinal sinus was exposed and two incisions about 1 millimeter in length made in it. A small pledget of fibrin foam saturated with human thrombin solution was placed upon one bleeding point, covered with moist cotton, suction applied for a few seconds and the foam gently held in position for a few more seconds. The cotton was then removed and the foam left in place. Upon the second bleeding point a piece of gelatin sponge of the same size saturated with human thrombin was placed in exactly the same manner. The wound was then closed in layers with interrupted silk sutures.

In all instances there was immediate and complete cessation of bleeding when either the foam or gelatin sponge was employed. The two materials seemed equally satisfactory in this regard. Because of its physical properties the gelatin sponge was easier to cut into the desired size and had less tendency to crumble.

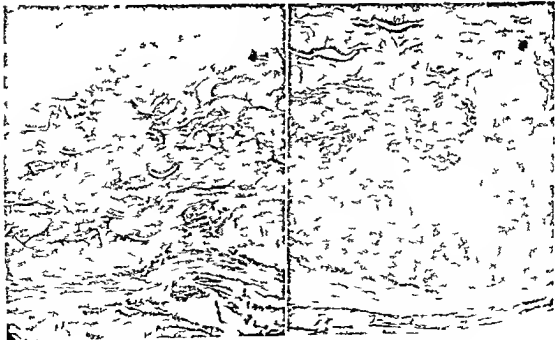
The dogs recovered promptly and none showed evidence of toxic or anemic reaction.

The animals were sacrificed in pairs at intervals of 2 days, 4 days, 1 week, 2 weeks, 4 weeks and 6 weeks after operation. The areas in which foam and sponge had been applied were somewhat adherent to the overlying tissues and the foam and sponge (or in longer experiments the fibrous tissue with which they had been replaced) were firmly adherent.

From the Department of Surgery, Vanderbilt University School of Medicine, Nashville, Tennessee. Received for publication, December 1, 1941. This work was supported in part by a grant from the National Research Council, U. S. Army Medical Research Service, and the National Cancer Institute, U. S. Department of Health, Education and Welfare.



Fg Glt po g lft d fbn f m b ht d ys ft impl t t th d ra \ t th l oy
 flt t f th fb fill d p ll m t y l d X7



f O k ft impl tat l ft Gelatu po b n h th f m ll m t y l d os X

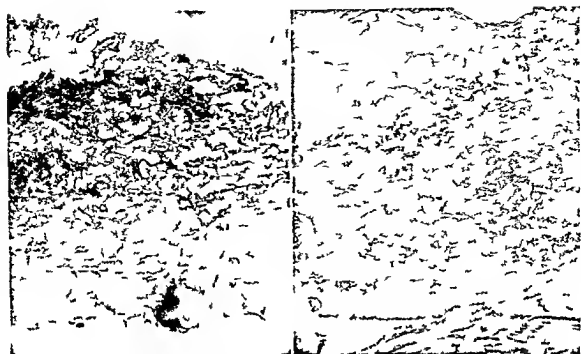


Fig. 1. T. k. ft. pl. t. t. 1 ft. G. t. 1 s. b. ght. fb. f. 1 b. pl. d. d. ll. flt.
u. fl. t. yl. d. X7

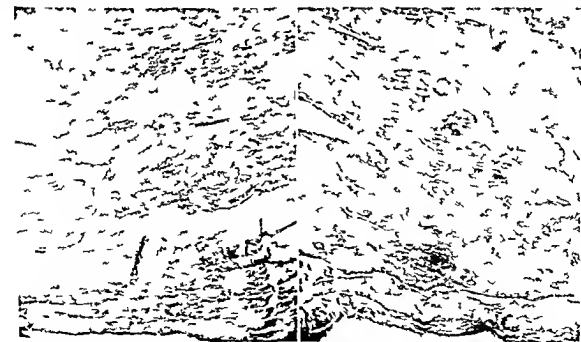


Fig. 2. T. k. ft. pl. t. t. 1 ft. G. t. 1 s. b. ght. fb. f. 1 b. pl. d. d. ll. flt.
u. fl. t. yl. d. X7

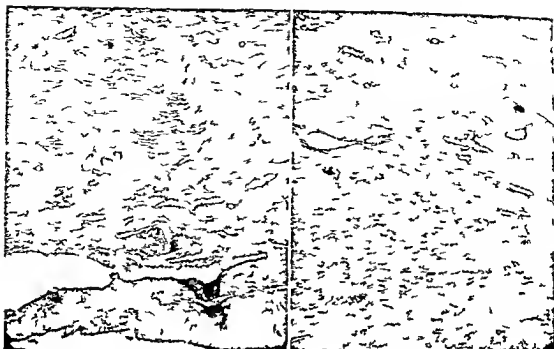


Fig 5 S k ft m p l t i l f t G l u p o g b h t f b f a m D n s i t t i l g
th g l t u H m t y l d e X

to the underlying dura. The longitudinal sinus was found to be patent in all animals. The areas of dura upon which the sponge and foam had been placed were removed, fixed in 10 per cent formalin and sectioned for histological study.

Microscopically the reaction to the two substances and their time of disappearance were quite similar. Comparable sections at the various intervals are shown in the accompanying photomicrographs.

There was an early infiltration of polymorphonuclear leucocytes. The infiltration involved the spaces in the sponge or foam previously filled with fibrin (Fig 1). Some times there developed a leucocytic mass between dura and foam with less infiltration into the foam itself, as though the latter were relatively impermeable to the cells (Fig 2 b).

By the end of one week (Fig 3) infiltration of fibroblasts and round cells was replacing the early inflammatory change and this process was more pronounced at 2 weeks (Fig 3). At the latter stage considerable absorption of

both foam and sponge had taken place and new blood vessels were producing a phase of granulation.

At 4 weeks both sponge and foam had completely disappeared except for tiny isolated fragments which were surrounded by a mild inflammatory reaction (Fig 4). Young blood vessels were still present but the fibrous tissue was growing more dense. At 6 weeks the sites of implantation of foam and sponge were almost completely healed with the formation of plaques of moderately dense elastic tissue (Fig 5).

In general the reaction to these materials was little if any more marked than would have been associated with the absorption of a simple hematoma of comparable size. No significant difference between the reactions to the foam and the sponge was detected.

CLINICAL OBSERVATIONS

Reports on the use of gelatin sponge in a total of 272 neurosurgical operations have been received from Dr Edwin Boldrey, Dr

THE VALUE OF GELATIN SPONGE AND HUMAN THROMBIN IN NEUROSURGERY

Cases	Tissue	Resist		Comparison with fibrin foam				Comments
		Good	Satisfactory	Not better	Firm	Soft	Equal	
Climax					5			
Craig	7			3				
D								
Fitch	5	5		5				
Harris	5	5		6	6			
Naffziger	3							8
Poppen								
Rich	6	6						
Swanson	3			6				
Woodhall				8				7
Woodhall								
Woodhall		5	8					

Claude Coleman Dr William Cone Captain William Craig Dr Loyall Davis Dr Edgar Fincher Dr Gilbert Horrax Dr Howard Naffziger Dr Wilder Tenfield Dr J L Poppen Dr Bronson Ray Dr Ernest Sachs Dr Homer Swanson Captain B B Whitcomb Lieut Colonel Barnes Woodhall and ourselves. In 115 of these procedures fibrin foam was also employed for comparative purposes. Human thrombin was employed exclusively since it was desired not to introduce any additional factor which might influence evaluation of the sponge.

The reports have been submitted soon after the operative procedures and have presented the surgeons' impressions of the value of gelatin sponge saturated with a solution of thrombin as a hemostatic agent. However, in extensive correspondence no harmful late effects have been reported and in our own case none have been observed.

The sponge has proved most useful in the control of epidural venous bleeding particularly under the bone edge adjacent to an osteoplastic flap of diffuse oozing in a tumor bed epidural bleeding in the pinal canal and in the preparation of a large bed for a

sutured peripheral nerve. Arterial bleeding is seldom controlled unless in such a position that pressure can be maintained.

A summary of the reports received appears in the accompanying table. Every investigator has found the sponge to be satisfactory in the great majority of his cases and has expressed a highly favorable opinion regarding its usefulness. In 5 of the 8 instances in which it has been reported unsatisfactory the investigator offered a reason not attributable to the sponge to explain the poor result.

The opinions expressing greater satisfaction with gelatin sponge than with fibrin foam are based entirely not on the failure of the latter to effect hemostasis but on the greater ease of handling the sponge. It has no tendency to crumble or fragment, can be cut with a knife or scissors when either wet or dry and retains excellent tensile strength when wet. In only 3 of 115 cases did the surgeon consider the sponge inferior to fibrin foam. It was considered superior in 70 cases but equally satisfactory in 42.

CONCLUSIONS

In view of the observations of Light (3, 6) and of the results reported herein it seems justifiable to conclude that absorbable gelatin sponge is a safe and efficacious medium for the application of thrombin in the control of venous bleeding in neurosurgical operations. It is usually easier to handle than fibrin foam and it can be produced in quantity by a simple process from a plentiful and inexpensive substance.

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3. I. M. F. D. I. B. V. O. T. J. N. oc. g.
4. 944 3
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EXCISION OF THE FRACTURED PATELLA

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BECAUSE of its prominent position at the anterior aspect of the knee the patella is vulnerable in direct as well as indirect injuries to the knee. In direct injuries such as a fall on the flexed knee the patella is particularly prone to fracture. In indirect injury such as a sudden violent contraction of the quadriceps one of four types of defect may occur to cause a disruption of the extensor mechanism of the knee. The patella may fracture the quadriceps or patellar tendons may rupture or the tibial tubercle may become avulsed.

Our particular consideration at present is with the fractured patella. Therapy in the other three instances is clear cut. Avulsed tibial tubercles are readily reduced and may be fixed in position by a screw. Ruptures of the quadriceps or patellar tendon require open operation for repair. The end results in all three of the instances are usually good without disabling sequelae.

THERAPEUTIC PROCEDURES FOR FRACTURED PATELLAE

In the case of the fractured patella however therapeutic procedures are not uniform. Many of the following have been used:

1 Rest in bed with adhesive strapping to coapt the patellar fragment

Plaster-of-Paris immobilization

3 Percutaneous circumferential wiring of the patella with flexible stainless steel wire acting as a pursestring suture

4 Kirschner wires drilled percutaneously in crucial fashion through the patellar fragments to immobilize them

5 Open reduction with suture of patellar fragment and quadriceps tendinous expansions. Catgut silk linen fascia lata kangaroo tendon and wire have been employed as suture material

6 Open reduction and fixation of the fracture with nail screw or plate

7 Bone graft in cases of nonunion

8 Partial excision with suture of the involved quadriceps or patellar tendon to the remaining fragment

9 Complete excision of the patella

The mere fact that so many types of treatment have been employed is an indication of the lack of satisfaction with any one of them.

Disadvantages of closed or open reduction
Since the beginning of the 19th century open reduction has been the method of choice in treating fractures of the patella with wide separation. The incidence of nonunion and fibrous union has been much greater with closed reduction than with the open method. However even with the latter bony union is not always obtained. The result did improve after particular care was taken to repair the lacerated quadriceps expansion. But even then nonunion and fibrous union have been too frequent. This fact produces a sense of insecurity in the involved knee particularly when walking stair. Some form of external support is often required to control this instability. Frequently in cases with fibrous union and even with bony union refracture occurs whether treated originally by closed or open reduction. It has been reported that 10 per cent of fractured patellae refracture. The recurrence may take place without actual trauma but merely following strong sudden contraction of the quadriceps. The majority occur within the first year but they may occur several years later. A further complication is the malunion of fractured patellae. In many cases the patellar fragments unite with some irregularity of the articular surface. Arthritic changes develop with painful restricted mobility and weak undependable knee. At times it is necessary secondarily to remove the wire suture or even the patella.

Excision of the patella
In view of the complicating sequelae noted which may follow open as well as closed attempts to obtain bony union excision of the patella has become a popular method of therapy. Partial or com-

plate excision may be performed depending upon the local findings in each instance. Total patellectomy is particularly indicated in severely comminuted fractures. Compound comminuted fractures due to gunshot wound may be so badly shattered that nothing but total excision should be considered. Usually the degree of comminution noted at operation is much greater than the roentgenograms indicate. These cases are more commonly seen in the service. In civilian life simple transverse fractures of the patella comprise the large majority of cases. Total patellectomy may even be preferable here originally when one considers the possibility of developing nonunion or fibrous union, union with secondary arthritic changes, union with restricted mobility and refracture. In some cases the fragments unite with lengthening of the patella which may restrict joint motion. Excision of the patella is being employed in case of arthritis involving the patella whether there has been a fracture or not.

Advantages of patellectomy. There are many advantages in the treatment of fractured patellae by excision. Patellectomy offers a rapid progressive uneventful recovery in practically all instances. This fact holds true even in the compound cases provided strict adherence to the principles of therapy in such instances is followed. The wound should be thoroughly debrided and cleansed. Following excision of the patella the joint capsule should be loosely closed with interrupted sutures. The remaining wound is left open for secondary closure after clinical evidence indicates that there is no infection. With the use of sulfonamides or penicillin locally and parenterally the incidence of infection can be held to a minimum. This statement is particularly true when the patella has been excised and has thereby been removed as a source of infection. Even in the occasional case of infection complicating compound fractures of the patella the prognosis for a well functioning mobile knee is better when patellectomy has been performed than when the patella has been permitted to remain.

The operative convalescence following patellectomy is much shorter than after open reduction.

reduction require plaster of Paris immobilization for approximately 4 to 6 weeks. The period of fixation will vary with the degree of injury and in open cases with the suture material used for repair. Following this an indefinite but usually long period of physical therapy and reconditioning is required to obtain free motion of the knee and strong quadriceps power. It may be 4 to 6 months before the patients return to strenuous activity. Even then the knee may be symptomatic and refracture may occur. Conversely in the healing of repaired fractures excessive regenerative changes may take place. Calcium is laid down giving the appearance of an abnormally large patella. In either case there is usually some loss of joint motion. Generally the patella is considered to have little osteogenic property.

Following patellectomy however the patient may be walking without dressings or support at the end of 2 to 3 weeks. Motion and quadriceps exercises can be instituted shortly after operation and a normally mobile and stable knee with complete function can be obtained within 6 to 8 weeks. Rehabilitation is progressive and rapid. In 2 of the cases to be reported in which the patella was fractured by gunshot wound the missile also damaged the articular surface of one of the femoral condyles. Yet there was no restriction of motion and no disability. One of these patients a paratrooper returned to jump duty. Patellectomy does not adversely affect motion, strength or stability of the knee. In soldiers with unilateral patellar fractures and complicated femoral or tibial fractures of the opposite extremity excision of the patella permits them early ambulation with weight bearing on the patellectomized extremity.

Partial excision of the patella may be indicated in cases of comminution at either pole of the bone. The small fragments are removed and the patellar or quadriceps tendon is sutured to and through the remaining large fragment. Normally it is the lower pole of the patella that is comminuted and excised. This circumstance leaves a large portion of the patella proximally to protect the femoral condyles when kneeling. In these cases union of the tendinous structure alone is involved and

the required time of immobilization is again shorter than when reduction is attempted. Approximately 3 to 4 weeks is adequate.

Disadvantages of patellectomy and regeneration of the patella. Resection of the patella is said to have several disadvantages. One is that it removes the normal protection for the femoral condyles. Dobbie and Ryerson however quote R. Brooke of England as stating that the patella is merely a morphological remnant phylogenically inherited and that it is tending to undergo reduction in size and to disappear. Brooke claims that it plays no functional part and that in its absence the efficiency of the knee joint is increased both in rapidity of movement and power. Nevertheless following patellectomy the articular cartilage over the femoral condyles and intercondylar space anteriorly is left exposed to direct trauma. Occasionally there may be pain when kneeling. Regeneration of a new patella in kind however generally affords adequate protection.

Dobbie and Ryerson quote Carey Zeit and McGrath in their published findings relating to the regeneration of the patella in dogs. Regeneration is said to occur under adequate mechanical conditions. The requisites are a normally mobile joint following patellectomy and adequate repair of the soft parts. Evidence of regeneration experimentally in dogs is said to appear roentgenographically in from 17 to 60 days. When adequate conditions do not prevail and the knee is not mobile due to joint fixation regeneration fails to take place. In other words the actual existence of a patella is based upon the functional need of a sesamoid bone at the site of pressure and tension where the quadriceps tendon glides over the femoral condyles in a freely movable joint. This observation appears to be substantiated by the cartilaginous and bone atrophy of the patella in cases in which the mobility of the knee is lost either by fusion or arthrodesis. There is no record however of total and complete regeneration of a new patella. In many cases actually there is no roentgenographic evidence of even partial regeneration of a new patella. Yet clinically one can palpate a firm round or oval movable body within the quadriceps tendon at the site of the old patella. The

body may consist of cartilage or fibrocartilage and therefore remain radiolucent. However it appears to function as well as a normal patella and afford adequate protection to the femoral condylar cartilage.

A second objection to the patellectomy is said to be the cosmetic change in the knee. It is true that the prominence of the normal patella is lost and even in case of patellar regeneration there is failure completely to recover the normal topography of the knee. However this objection is in no way compared with the benefits derived from excision of the bone in properly selected cases.

A third objection to patellectomy is said to be the diminution of pulley action which the patella normally produces during active extension of the knee. The patella does carry the quadriceps tendon away from the femoral condyles and theoretically should increase the efficiency of the muscle by its leverage action. However one cannot disregard the excellently functioning powerful knees that are seen clinically following excision of the patella. The uniformly good results following patellectomy fully justify the theoretically mathematical diminution of leverage action of the quadriceps. This statement is especially true when one considers the possible untoward sequelae that may result in attempting to obtain bony union of the patella. Beside regeneration of the patella tend to minimize and restore the theoretical loss of the leverage action.

Anatomy. In order fully to appreciate the operative technique consideration of the local anatomy may be in order. The quadriceps femoris the great extensor of the leg is subdivided into four portions the rectus femoris the vastus lateralis the vastus medialis and the vastus intermedius. All subdivisions converge at the distal end of the thigh anteriorly to form the quadriceps tendon which passes over the anterior surface of the patella and continues as the patellar tendon. The quadriceps tendon attaches to the base anterior surface and lateral borders of the patella. The patellar tendon inserts into the tibial tuberosity. In addition the quadriceps tendon gives off an expansion on either side of the patella to form the medial and lateral patellar

retinacula. These blend with the articular capsule and insert into the proximal end of the tibia on either side of the tuberosity. In fractures of the patella these expansions may be widely lacerated and it is important that they be thoroughly repaired. Thus it is seen that the patella may be regarded as a sesamoid bone developed within the tendon of the quadriceps.

Optimum time of operation. The interval between injury and operation varies with the general condition of the patient. In compound fracture thorough debridement and patellectomy should be performed as soon as it is safely possible. The earlier the wound is cleansed the less tendency is there for it to become infected. In simple fractures also there appears to be no advantage in operative delay. If there is no significant contraindication to immediate operation it should be performed directly after admission to the hospital. If hemorrhage can thereby be controlled thus avoiding unnecessary edema and infiltration of the soft tissues some surgeons feel however that when the soft tissues are moderately traumatized immediate operation will further damage them and jeopardize primary healing. They therefore prefer to wait about a week before operating. The decision primarily is a personal one but generally judicious operative delay offers no advantage.

TECHNIQUE OF OPERATION

In compound gunshot wounds fractures whether penetrating or perforating the wound should be adequately exposed in order to permit thorough debridement. The author has had occasion to treat perforating gunshot wounds with compound fractures when the roentgenograms were negative for foreign bodies. The wound entrance and exit were small yet exposure of them revealed the characteristic coloration of muscle indicative of necrosis. In such cases it is imperative that the blood-clotted area be excised since it may act as an excellent medium for the growth of anaerobic organisms. Following the removal of the patellectomy the joint capsule is closed by loosely packing with iodoform gauze. Secondary drainage can be



Fig. 1. Case of fracture of patella. Patient admitted to hospital October 9, 1943. Right knee. No fracture. Fracture of patella.

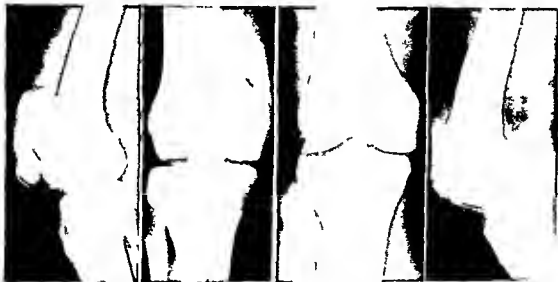
performed in approximately a week provided there is no evidence of infection.

In simple fractures either a vertical or transverse incision is employed centered over the patella. The former requires wide dissection laterally of skin and flaps in order to expose the quadriceps expansions. The latter approach permits an easier exposure of the patellar retinacula. It is also preferable since it can be made within the skin crease and therefore will heal with less tendency to thickening which may prevent free flexion of the knee. Blood clot is removed and the patellar fragments excised care being taken to retain intact the quadriceps tendon anterior to the patellar fragments. The frayed edges of the extensor tendon and its expansions are then debrided and repaired. Interrupted sutures are employed beginning at both ends of the rent in the expansions and working centrally to tendon. This procedure makes closure much easier. Remaining wound is closed in layers.

Postoperative care. It is preferable to immobilize the knee with a posterior splint for 10 days. However a firm flannel or stockinette bandage may also be employed. The important factor is that acute flexion of the knee be avoided until the repaired tendon is well healed. The healing requires approximately 3 weeks. Postoperative immobilization is not objectionable in cases of patellectomy. One



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of our patients remained in a plaster of Paris cast for 7 weeks during his evacuation to the zone of interior. Yet he has a strong well functioning knee with a full range of motion. When the splint is removed at the end of the first week, the patient may be encouraged to

begin flexing the knee gently. After the third week, complete flexion should be strived for. Quadriceps setting exercises are also instituted upon removal of the splint.

Weight bearing with the aid of a cane and posterior knee splint may be permitted at the



Fig. 3. Case 6. b. Longitudinal section of the right patella. D.ber 5.043. Full length from base of leg. Th. g. reg. 1. Full length of patella.

end of 1 week. However full weight bearing without support should be delayed until the third week. By the end of 6 to 8 weeks the patient should be able to walk normally for a full day on level ground as well as up and down stairs. One of our patients returned to parachut jump status at the end of 3 months. Complete rehabilitation is generally obtained at the end of not more than 12 weeks.

END RESULTS

In case of total excision of the patella the final result is generally excellent. The pa-

Fig. 4. Case 6. b. Longitudinal section of the right patella. D.ber 5.043. Full length from base of leg. Th. g. reg. 1. Full length of patella.

tient obtain a normally functioning knee with complete range of motion, normal stability and powerful extension. They are able to walk long distances and can manage stairs without difficulty. They are able to squat fully on both legs and arise with ease. They can even squat partially on the involved extremity alone and arise to the erect position without undue effort. One patient could squat completely and arise on the involved extremity alone. Kneeling may cause discomfort temporarily but usually this subsides in time. One of the cases to be reported developed an



Fig 4. Roe, 1933. Gram of knee joint. So 3 90 d 4 degrees d cat p rres m t fth po
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infection of the knee joint postoperatively yet he obtained a well functioning and almost completely movable knee. Had the patella remained I doubt whether such a good result would have been obtained. In the presence of infection the patella usually becomes fixed to the femur either partially or completely and thereby restricts mobility of the joint.

CASE REPORTS

CASE 1. Patient admitted St. H. pt. 1
Camp Mackall No. 10 Oct. 6 1943
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me is again became w dely separated. This a parat on occurred 3 months after the orig nal injury. The following day the patellar fragments ere compl tely excised and the tendons approximated and sutured. There was no evidence of callus at operation.

At pres nt the patient has a strong well function g right knee. He is able to balance and squat partially on the right lo er extremity alone and then re ume th erect positio. He is able to squat completely on both lower extremities without difficulty. Mot on l the knee is complete and stability is n rm l. He is able to h p on the right foot without buckling of the knee. Keeling n a hard suriac causes mild d scomfort.

CASE 4. Sold er was injured by shrapnel on May 16 1944 at Anzi Italy sustaining a compo n l comminuted fractu e f the left patella. At operati on May 17 the patella was found to be comminuted more than th ro ntgenograms had dicated. It was th r for e cised. A la ge piece of shrapnel was f und in th infrapatella fat pad. The a ter r comp rtment of the kne e joint. It had gouged ut an area 5 ce timet rs i diameter f om th lateral f moral co dyle. The foreign body was removed and the edges of th a ticular defect smoothed. The joint was irrigated and 0000 units of penicillin instilled th it. The synov was closed with interrupted sutures and the remainder of the wound gently packed with aselin gauze. Th leg was immobilized in plaster. The patient was given 25000 units f penicillin i tr m sc la ly e ery 3 h urs for a total of 825000 units i 100 h u.

On May 27 a s co dary cl sur f the wound was performed. The quadriceps and tellar tendons were coapt d and s t red a d the joint capsule closed. Th r m der f the wound was closed in layers. Plaster of Paris immobilization s employed. This plaster r m ed o th ough ut the pti s evacuated nt the e of int r r. It was removed i n July 14 7 weeks aft r applicati. At that tim knee motion was possible only from 80 to 160 d g. At pres th rang of m ti n i m 180 to 40 d g s w th g dnceps power f a plus. Stability of the kne e s good a l rat nt is able to alk q t v l l. O p ipat on nega s the mp s that th r s reg erati. f a small p t lla fl v r th gen rat n is not s ble n the x rays films lat t c n balance h m. If w l l on th m vol ed leg sq t partially and r ume th r ct post w th o t d i c u l t y. With e ght d str buted n both f et he ca q a l m t c m p l tely. He s be g r d u n d f r et m t duty.

CASE 5. I rat ope was admitted to Station Hospital Camp Mackall North Carolina on December 1 1943 with p forati g 45 caliber bullet wound thro h th r ht knee. He sust i ed a comminuted fra t c f th proximal third of the patella. Ro ntgenograms f th kne als re ale d a defect in th a ticular surf ce f the l t r al femoral c

Th entra ce and exit wounds were enlarged and debrided. In addition to the comminution of th patella noted in the ro ntgenograms there was also noted at operation a complete longitudinal fracture. The patella was excised i toto and the defect in the femoral condyle smoothed. The joint was flushed with sodium sulfathiazole solution. Plaster of Paris immobilization was employed for 1 week. About 3 weeks later the patient began to walk. He was last seen by me on February 29 1944 at wh ch time he was back on full jump status. He had a complete range of painless motion in the knee and his quadriceps power was excellent. Stability of the knee was normal. Patient was able to balance and squat completely on the vol ed leg alone and return to the erect posit on without difficulty. He was able to walk stairs with ease. His knee was functionally as normal as before his injury.

CASE 6. Soldier fell off a horse on December 15 1943 while in New Zealand and sustained a longitudinal fracture of the lateral portion of the right patella. He was treated with bed rest and plaster of Paris immobilization for 2 weeks. He was then permitted up with crutches and gradually walked with support. He returned to duty but th pain i the knee increased. Check up ro ntgenograms taken on April 15 1944 revealed nonunion of the fracture. Accordingly on April 25 patellectomy as performed. On May 4 1944 he began to run an elevated temperature and on May 23 the knee was excised and seropurulent material obtained. On July 19 th knee was manipulated. When examined by me on September 26 he presented a fairly good knee. He walked without a limp and stability of the knee was normal. He could balance and squat partially on the involved leg alone returning to the erect posit n. There was some restriction of motion which was possible from 18 to 110 d g r es. Quadriceps power rated a plus. On p lpat none g ned th impression that an indefinitely outlined reg nerated patella as pre nt. Ro ntgenograms s bstantiated the progress e deposit n f calcium within the q ad cep and patella tendon.

Knee joint infections without patellectomy usually result in a much more disabling and stiffer joint than this patient has. The patella usually becomes fixed to the femur and causes marked restriction of motion. Excision of the patella in this case has permitted a more freely movable and useful joint despite the complicating infection.

CONCLUSIONS

1. The treatment of fractured patellae in the past by so many methods is indicative of dissatisfaction with all of them.

2. When one considers the possibility of fibrous union or nonunion union with restricted

mobility and instability and union with secondary arthritic changes one notes the shortcomings of open as well as closed reduction of the patella

3 The high incidence of refracture of the patella even following open reduction reveals the need for a more effective method of treatment

4 Excision of the patella either partial or complete is the method of choice in fractures

5 Partial excision with removal of the small comminuted fragments alone is indicated only when a large uninvolved portion of the patella can be left *in situ*

6 In all other instances of fracture total excision is preferable for the following reasons
(a) Rapid progressive uneventful recovery usu-

ally ensues (b) postoperative immobilization and convalescence are shortened (c) true stable and freely movable knee joints are generally obtained (d) even when complicating infections occur the prognosis is better when patellectomy has been performed (e) excision of the patella does not impair the efficiency of the knee

7 Regeneration in kind may occur following excision of the patella to protect the exposed femoral condyles

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INACTIVATION OF PENICILLIN BY VARIOUS GRAM NEGATIVE BACTERIA

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METHODS

ALTHOUGH the majority of infections seen by the surgeon are caused by the staphylococcus and the streptococcus many are mixed infections produced by these and various other bacteria particularly the gram negative bacilli. In the treatment of established infections of surface wound and abscesses pure staphylococcal or streptococcal infections have responded much more rapidly and completely to general or topical penicillin therapy than did mixed infections. The course of many of the mixed infections seemed to be completely unaffected by penicillin and even the staphylococci and streptococci remained present in large numbers in the exudates. This fact suggested that the penicillin was being inactivated or destroyed in the infected area probably by the action of the various gram negative bacteria. To explain these differences of response to penicillin therapy a study was undertaken to measure (1) the effect of penicillin on the growth of the gram negative bacilli frequently found in infected wounds and (2) the effect of various gram negative bacilli on the activity of penicillin.

It is well known that penicillin is a labile substance which is destroyed by heat prolonged exposure to the air and oxidizing or reducing agents. In addition Abraham and Chain have found that extracts of *Escherichia coli* prepared by crushing a suspension of the organisms in a bacterial crushing mill destroyed the bacteriostatic property of penicillin. They believed the active substance in these extracts to be an enzyme because it was not dialyzable through a cellophane membrane and because it was inactivated by heating at 90 degrees C for 5 minutes or incubation with pepsin.

The gram negative bacteria commonly found in infected wounds burns or deeper abscesses are *Escherichia coli*, *Bacillus pyocyaneus*, *Aerobacter aerogenes*, *Bacillus proteus* and *Bacillus alkaligenes fecalis*. Representative strains of each of these bacteria were obtained from infected wounds and cultures of each in broth were used throughout the experiments.

In the first group of experiments six series of culture tubes of broth media containing various concentrations of sodium penicillin from 0.003 to 5000 units per cubic centimeter were prepared. Five of the series were then inoculated with 0.1 cubic centimeter of an 18 hour culture of one of the various gram negative bacteria and the sixth with 0.1 cubic centimeter of an 18 hour culture of a susceptible strain of hemolytic *Staphylococcus aureus* which was used as a control. After 4 8 12 16 and 20 hour periods of incubation the effect of penicillin on the rate and amount of growth was determined with the aid of a turbidimeter.

In the second group of experiments the effect of the various gram negative bacilli on penicillin was studied *in vitro*. Tubes of broth media containing 20 units of penicillin per cubic centimeter were inoculated with 0.1 cubic centimeter of an 18 hour culture of one of the gram negative bacilli and incubated at 4 8 12 16 and 20 hours respectively. Another tube containing an equal number of units of penicillin per cubic centimeter was used as a control and incubated for 20 hours without bacterial inoculation. After the various periods of incubation the cultures were passed through a Berkefeld filter to remove the bacilli. The antibacterial activity of the bacterial free filtrates was then measured for the hemolytic *Staphylococcus aureus* by determining the greatest dilution at which growth was inhibited.

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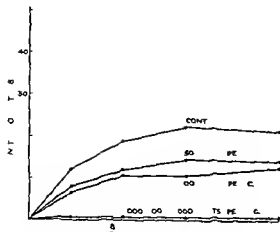


Fig. Inhibitory effect of higher concentrations of penicillin on the growth of *Escherichia coli*.

RESULTS

Effect of penicillin on the rate and amount of growth of gram negative bacilli. When inoculations of *Escherichia coli*, *Bacillus pyocyaneus*, *Aerobacter aerogenes*, *Bacillus proteus*, and *Bacillus alkaligenes fecalis* were made into five series of culture tubes containing concentrations of penicillin from 0.009 to 5000 units per cubic centimeter of beef infusion broth the effect of penicillin after incubation for 18 hours is shown in Table I. Little or no inhibitory action on the growth of *Escherichia*

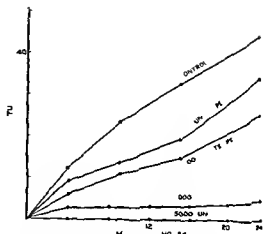


Fig. Inhibitory effect of *Escherichia coli* of penicillin.

coli, *Bacillus pyocyaneus*, *Aerobacter aerogenes*, and *Bacillus proteus* occurred. On the other hand *Bacillus alkaligenes fecalis* was almost completely inhibited by 0.039 units of penicillin per cubic centimeter. Further studies on four other strains of *Bacillus alkaligenes fecalis* have shown all to be sensitive to the action of penicillin. The sensitivity of the hemolytic *Staphylococcus aureus* was used as a control for the purpose of testing the activity of penicillin.

If higher concentrations of penicillin were used such as 50, 100, 250, 500, 1000, 2000, and 5000 units per cubic centimeter of media a definite inhibitory effect on the rate and amount of growth of *Escherichia coli* was apparent. If the amount of growth was measured in units of turbidity on the turbidimeter at intervals of 4 hours it was found that the inhibitory action increased with the concentrations of penicillin. This fact is shown graphically in Figures 1 and 2. The degree of inhibition varied with the strain of *Escherichia coli*. In Figure 1 it will be noted that growth was completely inhibited by 1000 units per cubic centimeter and in Figure 2 by 5000 units per cubic centimeter.

The inhibitory effect was of a bacteriostatic nature since subcultures were always positive.

A similar but less marked inhibition was caused by higher concentrations of penicillin on the growth of *Aerobacter aerogenes* (Fig. 3).

TABLE I—EFFECT OF PENICILLIN AFTER INCUBATION FOR 18 HOURS

Conc.	<i>E. coli</i>	<i>B. Pyocyaneus</i>	<i>A. A. aerogenes</i>	<i>B. Proteus</i>	<i>B. Alkaligenes fecalis</i>	<i>Staph. aureus</i> (Control)
0.009	++++	++++	++++	++++	—	—
0.039	++++	++++	++++	++++	—	—
0.156	++++	++++	++++	++++	—	—
0.625	++++	++++	++++	++++	—	—
2.5	++++	++++	++++	++++	—	—
10	++++	++++	++++	++++	—	—
40	++++	++++	++++	++++	—	—
160	++++	++++	++++	++++	—	—
640	++++	++++	++++	++++	—	—
2560	++++	++++	++++	++++	+	++
5120	++++	++++	++++	++++	++	+++
10240	++++	++++	++++	++++	+++	++++

Sh. wing lack f. n. h. r. y. ac. f. f. we co. en. ra. as f. penicillin. th. f. van. us. gr. m. g. ve. bac. i. us. hemolyt. S. h. lococcus reus as co. rol.

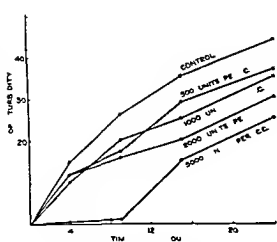


Fig 3 Inhibitory effect of high concentrations of penicillin on growth of Escherichia coli

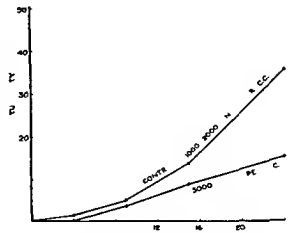


Fig 4 Effect of high concentrations of penicillin on growth of Bacillus pyocyaneus

On the other hand many of the strains of *Bacillus pyocyaneus* tested showed marked resistance to concentrations of penicillin as high as 5000 units per cubic centimeter (Fig 4)

The effect of gram negative bacilli on penicillin After tubes of broth media containing 20 units of penicillin per cubic centimeter were inoculated with *Escherichia coli* incubated for 4 8 16 and 20 hours and then passed through a Berkefeld filter to remove the bacilli the antibacterial activity of the filtrate for the

hemolytic *Staphylococcus aureus* was measured by determining the greatest dilution at which bacterial growth was inhibited. It was found that the penicillin activity had been progressively destroyed after 4 8 and 12 hours growth of the colon bacilli. The destruction was practically complete at 12 hours. The control retained its marked antibacterial action for the hemolytic *Staphylococcus aureus* after 20 hours incubation and filtration.

The same experiment was repeated with *Bacillus pyocyaneus* and a similar progressive

TABLE II — SHOWING THE DESTRUCTIVE ACTION OF CULTURES OF *ESCHERICHIA COLI* ON PENICILLIN

Dilution of bacteria in broth					
Dilution	1	2	3	4	Control
1	—	—	+	++++	++++
2	—	—	+	++++	++++
3	—	—	++	++++	++++
4	—	—	++	++++	++++
5	—	+	+++	++++	++++
6	—	++	++++	++++	++++
7	+	+++	++++	++++	++++
8	+++	++++	++++	++++	++++
9	++++	++++	++++	++++	++++
10	++++	++++	++++	++++	++++
11	++++	++++	++++	++++	++++
12	++++	++++	++++	++++	++++

Bacterial free filtrate from incubation with *Escherichia coli*

TABLE III — SHOWING DESTRUCTIVE ACTION OF CULTURES OF *BACILLUS PYOCYANEUS* ON PENICILLIN

Dilution of cultures with <i>B. pyocyaneus</i>				
Dilution	1	2	3	Control
1	—	—	++	—
2	—	—	++	—
3	—	—	++	—
4	+	++	+++	—
5	++	+++	++++	—
6	++	+++	++++	—
7	+++	+++	++++	—
8	+++	+++	++++	—
9	+++	+++	++++	—
10	+++	+++	++++	—
11	+++	+++	++++	—
12	+++	+++	++++	—

Bacterial free filtrate from incubation with *Bacillus pyocyaneus*

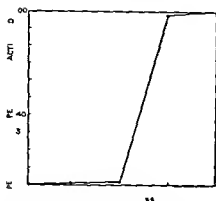


Fig 5 P tag d t f penicillin in a t u by
u ly gr g e l t e s f B cill pyocy

destruction of penicillin was noted (Table III)

When the percentage and rate of penicillin inactivation were charted it was noted that approximately 98 per cent of the penicillin was destroyed within 12 hours and almost all of this during the 8 to 12 hour period by *Escherichia coli* and *Bacillus pyocyaneus* (Fig 5)

Aerobacter aerogenes produced a similar but lesser degree of penicillin inhibition (Table IV)

On the other hand *Bacillus proteus* had but little destructive effect on the activity of penicillin (Table V)

TABLE IV.—SHOWING EFFECT OF CULTURES OF *AEROBACTER AEROGENES* ON PENICILLIN

Dilution	Amount	1	2	3	4	Control
1	—	—	—	—	—	—
2	—	—	—	—	—	—
3	—	—	—	+	++	—
4	—	+	++	++	++	—
5	++	++	++	++++	—	—
6	++	+++	++++	++++	—	—
7	+++	++++	++++	++++	—	—
8	++++	++++	++++	++++	—	—
9	++++	++++	++++	++++	++	—
10	++++	++++	++++	++++	++++	—

Bacterial free filtrates containing penicillin after incubation with *Aerobacter aerogenes*

When a 24 hour culture of *Escherichia coli* grown in the absence of penicillin was passed through a filter the bacterial free filtrate did not contain a substance which inactivated penicillin. At the end of 4 and 16 hours incubation with penicillin no significant loss of antibacterial activity for the hemolytic *Staphylococcus aureus* was noted. Likewise no significant destruction of penicillin was produced by the action of heat killed cultures of *Escherichia coli*.

ANALYSIS OF STUDY

Escherichia coli, *Bacillus pyocyaneus*, *Aerobacter aerogenes* and *Bacillus proteus* are frequently found in infected wounds and burns in association with staphylococci and other bacteria. They are completely resistant to the action of 20 units of penicillin per cubic centimeter, a concentration greater than any produced in the blood and tissues by parenteral administration. High concentrations of 50, 100, 250, 500, 1000, 2000 and 5000 units have a definite but incomplete inhibitory effect on the rate and amount of growth of many of these bacteria although the effect varies in degree with different strains of the same organism. The action is bacteriostatic since the inhibited bacilli grow profusely on subcultivation in penicillin free media. Five strains of *Bacillus alkaligenes fecalis* on the other hand were very sensitive to the action of penicillin.

TABLE V.—SHOWING EFFECT OF CULTURES OF *BACILLUS PROTEUS* ON PENICILLIN

Dilution	Amount	1	2	3	Control
1	—	—	—	—	—
2	—	—	—	—	—
3	—	—	—	—	—
4	—	—	—	—	—
5	—	—	—	—	—
6	—	—	—	—	—
7	+	++	++	++	—
8	+	+++	+++	+++	—
9	+++	+++	+++	+++	++
10	++++	++++	++++	++++	+++

Bacterial free filtrates containing penicillin after incubation with *Bacillus proteus*

These studies explain at least in part the frequent failure of penicillin therapy in mixed infections of wounds

To overcome the destructive effect on penicillin produced by the gram negative bacteria these experiments suggest several principles in the local therapy of infected wounds

- 1 The removal of as many bacteria from the wounds as possible immediately preceding the topical application of penicillin The mechanical removal of devitalized tissue and purulent exudate by incision and drainage aspirations or irrigation greatly reduces the number of gram negative bacteria at the time of the topical application of penicillin Devitalized tissue invites and harbors gram negative bacillary infection and its removal by mechanical or chemical means would seem to be particularly important

- 2 The local application of higher concentrations of penicillin up to 1000 or 2000 units per cubic centimeter to inhibit as much as possible the growth of the gram negative bacilli and their destructive action

- 3 Application of penicillin at frequent intervals of 8 hours or less to compensate for the amount destroyed by the gram negative bacilli and to insure a level therapeutically effective for the penicillin sensitive bacteria also infecting the wound

CONCLUSIONS

- 1 Various gram negative bacilli commonly found in infected wounds were very resistant to the action of penicillin in concentrations up to 20 units per cubic centimeter Higher concentrations up to 2000 to 5000 units per cubic centimeter produced a definite inhibitory effect on their rate and amount of growth This effect was bacteriostatic in nature

- 2 *Bacillus alkaligenes fecalis* however was found to be very sensitive to penicillin

- 3 The activity of penicillin was progressively destroyed by the growth of these bacteria particularly the *Escherichia coli* and *Bacillus pyocyaneus* in 4 8 and 12 hours The rate of destruction was greatest during the 8 to 12 hour period

- 4 The degree of inactivation not only varied with the different types of bacteria but also with different strains of the same type

- 5 The mechanical removal of devitalized tissue and purulent exudate followed by the topical application of higher concentrations of penicillin up to 1000 or 2000 units per cubic centimeter at frequent intervals of 8 hours or less is suggested in the local therapy of infected wounds to minimize the gram negative bacterial inactivation of penicillin

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The patient was given plasma and blood transfusions immediately and taken to the operating room. Open peritoneal adhesions were admitted and the abdominal wall was infiltrated with 3½ per cent novocain solution in the right transverse plane just above the level of the umbilicus. The abdomen was opened through a transverse incision. The ether anesthesia was maintained at this time and the remainder of the procedure was performed under local anesthesia. The apex of the intussusception had progressed from the terminal ileum to the splenic flexure of the colon. The distal portion of the intussusception reduced with ease and the colon continued uninterrupted until the ileocecal valve was reached. The final stages of reduction was difficult but was finally accomplished with undue trauma to the bowel. The terminal ileum, cecum and terminal portion of the ascending colon were gangrenous. The omentum of the ileocecal colon was observed. The terminal 3 inches of the ileum, the cecum and proximal 2 inches of the ascending colon were removed and an open side-to-side anastomosis was done between the ileum and ascending colon. The incision was closed in layers with interrupted fine silk. Postoperatively the patient was placed on an oxygen tent and given parenteral fluids including blood plasma glucose and saline. Continuous gastric suction was maintained for 4 days. The ileal course was relatively smooth until the fifth postoperative day when the temperature became elevated to 102 degrees Fahrenheit. Examination revealed moderate erythema of the pharynx and intubation of the tympanic membrane bilaterally. The fever continued at this level for 5 days and then subsided with antipyretics. Normal bowel activity returned 3 days after the peritonectomy and oral feedings were resumed on the fifth day. The patient was discharged March 22, 1944, in a satisfactory clinical course since that time.

The factors militating against the accomplishment of primary resection have seemed so numerous and so uncompromising that the procedure has been condemned by many surgeons who because of their peculiar experience are qualified to speak authoritatively on the subject. Unfortunately the alternatives to resection with immediate restoration of continuity of the bowel in the presence of irreducibility and gangrene are associated with an equally forbidding mortality and are anatomically and physiologically less plausible.

FACTORS INFLUENCING RECOVERY

Significant factors which influence the course of intestinal resections in infants may be divided conveniently into 3 phases.

Preoperative phase. In the preoperative period the early recognition of the intussuscep-

tion is of paramount importance. The classical description of the disease is usually reproduced with such fidelity that the diagnosis is rarely difficult. Delay on the part of the parents in bringing the infant to the physician accounts for the majority of late diagnoses but occasionally the apparent benignancy of the condition and failure to feel the abdominal mass will lead the surgeon into grievous error.

Once the diagnosis has been established surgery should be delayed no longer than is required to render adequate preoperative preparation. This preparation should comprehend the treatment of shock which is often present in some degree and the restoration of fluid and electrolyte balance. Failure to observe this important aspect of preoperative therapy has in our opinion contributed in a real sense to the high mortality of intestinal resection in infants. The immediate administration of plasma until properly typed blood is available should be employed routinely and the infusion should be continued throughout the operation. This procedure if carried out with dispatch need not delay surgical intervention.

A nasal catheter should be passed in order to maintain the stomach in a state of decompression during and subsequent to the operation. There can be little doubt that infants tolerate intubation poorly but we believe that the advantages outweigh the disadvantages even in patients of this age.

Operative phase. The important considerations bearing on the operative phase of treatment are numerous.

The anesthetic of choice is open drop ether but the related factors of depth, duration and supplemental agents deserve particular attention. Infants already suffering from shock submitting to a major surgical procedure which involves considerable manipulation of the abdominal viscera tolerate deep and prolonged anesthetic very poorly. Consequently it has been our practice to administer light ether anesthesia followed by liberal infiltration of the abdominal wall in the region of the proposed incision with a 1½ per cent solution of novocain. The abdomen is opened and the portion of the intussusception which can be reduced easily is manipulated intra abdominally.

The diffuse form Chronic ulceration causes extensive thickening and fibrosis of all layers of the bowel. Multiple areas are affected with a predilection for the cecum and sigmoid colon and alternate with segments of attenuated intestinal wall. Occasionally the whole length of the large intestine is thickened.

The localized form is discussed under amebic granuloma.

The solitary chronic ulcer most often occurs in the rectum. The size varies and may extend to several square inches. Euberant vascular granulation tissue is found in the base and the margins are thickened and edematous—appearances which may readily be mistaken for malignancy. The mucous membrane in the vicinity may be very edematous in the form of pseudo polyps. Chronic amebic ulcers may very occasionally become malignant (27).

The fibrous stricture Rogers considers that fibrous stricture rarely follows amebic infection (33) but this is not the experience of other observers (12, 24, 30). According to Lynch, When cicatricial deformity of the colon and extensive peritoneal fibrosis have resulted from prolonged or deep or extensive infection the damage is more or less permanent even if the ameba is eradicated. Stricture is probably the result of associated secondary infection for the *Endamoeba histolytica* induce little inflammatory reaction of itself (12). It is often surprising to see at sigmoidoscopy how even advanced amebic ulcers of longstanding resolve with little or no scarring. Applying the modern criteria for diagnosis including biopsy, amebiasis is a rare cause of rectal stricture. It may be noted here that the identification of the *Endamoeba histolytica* in the tissues requires special experience and in this type of lesion may present difficulty even to the expert.

Amebic granuloma or ameboma Prolonged infection under certain conditions as may occur in the delayed resolution of an acute infection gives rise to an inflammatory thickening which gradually becomes defined to form a discrete mass—in the case of amebic infection this is known as amebic granuloma or ameboma. The cecum is most often affected but ameboma may occur in the sigmoid and other parts of the colon. The omentum is

usually adherent and the appendix may be included in the mass which may also involve the ascending colon and attain a considerable size. To the naked eye the condition may suggest the results of acute appendicitis, diverticulitis or regional ileitis. Chronic amebic ulceration occasionally produces an analogous condition in which fibrosis predominates. When a localized segment is affected carcinoma, hypertrophic tuberculosis or diverticulitis may be closely simulated (13, 18).

Amebiasis of the appendix Amebic infection of the appendix arises by extension of the infection from the cecum and whenever the cecum is extensively affected the appendix is likely also to be involved. Most examples are subacute rather than acute. The incidence has been determined at postmortem examination of patients who died from amebic dysentery. In Clark's series of 186 postmortem examinations the appendix was involved in 41 per cent and 9.2 per cent abscess or perforation had occurred (8). His series is exceptional for only a small proportion of the patients had received emetine. Craik found 16 examples in 65 necropsies and Stron reported 7 in a series of 102.

➡ The pathological changes range from pinpoint ulcers confined to the mucosa and submucosa to inflammatory reaction which includes the whole organ. In the more severe infections edema is a prominent feature the walls are thickened, pus is found in the lumen and the serosa is congested and may be covered with fibrin. Similar changes are usually found in the cecum. Abscess and perforation have been cited but clinical experience indicates that these complications are rare if emetine is employed. Examination of the contents of the lumen usually discloses the *Endamoeba histolytica*. Apart from the presence of the ameba neither macroscopic nor microscopic appearances can be distinguished from those of nonamebic appendicitis. Remarkably few examples are reported in the literature of the discovery of the *Endamoeba histolytica* in the tissues of appendices removed at operation even though they have been present in the lumen (14, 18, 24) but they are often seen in postmortem specimens with coincident amebiasis of the cecum.

The majority of appendicular lesions which develop during an attack of acute cecal amebiasis are of this type but of course nonamebic acute appendicitis may also occur.

Following an attack of acute cecal amebiasis interval appendicectomy occasionally reveals gross changes in the form of constrictions and adhesions and the appendix may contain pus with amebae. Evidence of chronic inflammation is often seen on microscopic examination but how far the appearances can be attributed to the previous amebic infection is conjectural.

Local complications of intestinal amebiasis Perforation is frequently found at postmortem examination in fatal cases of intestinal amebiasis. Strong reports 19 per cent. and Clark 10.7 per cent. (8, 30) The commonest sites are the cecum, sigmoid appendix and rectum. Multiple perforations may take place. As in other diseases the lesion may be acute subacute or chronic and either intraperitoneal or extraperitoneal. Most perforations appear in association with fulminating attacks but the condition may arise in attacks of acute and chronic dysentery of any severity. In the retroperitoneal variety, abscesses may form and track widely into the perineal, subphrenic, and pelvic spaces. (10, 24)

Brief mention only will be made of other local complications. Spontaneous hemorrhage of serious proportions is occasionally seen—3 of our patients required transfusion on this account. Handling of the bowel at operation may be followed by dangerous hemorrhage from amebic ulcers; the cecum is particularly prone to this complication (3).

Intussusception is rare and no instance occurred in our series although examples were seen in Indian hospitals during the same period. Spontaneous reduction may occur as in a case reported by Parry. Adhesions, bands and kinking of the bowel are common sequelae and an occasional cause of intestinal obstruction (1).

CLINICAL ASPECTS AND DIAGNOSIS

The clinical manifestations are just as varied as the pathological. Atypical forms are common and may so closely simulate almost any gastrointestinal disease acute or

chronic that it is important to give every consideration to amebiasis in the differential diagnosis when dealing with patients who have lived in endemic areas. In spite of modern treatment relapse is frequent sometimes after a long interval of apparent good health and permanent cure should not be assumed.

The clinical diagnosis must be supported by the recognition of the *Endamoeba histolytica* in the stools or in specimens from the walls of sinuses or obtained at sigmoidoscopy or in biopsy material. In assessing the significance of the presence of the vegetative form of the *Endamoeba histolytica* the fact that amebiasis may coexist with other conditions should not be overlooked. *Endamoeba histolytica* cysts so often occur in the stools of individuals in whom there is no demonstrable sign of disease that of themselves they are of little diagnostic value.

A further check on the diagnosis is provided by observing the effects of treatment with emetine. If complete resolution is not obtained the diagnosis must be considered further to exclude a coexisting lesion. Very occasionally intestinal amebiasis is resistant to this drug—most often in examples of long standing infection or when emetine has been previously employed. The drug should be used with caution on account of its cumulative effect and the danger of toxic action on the myocardium and nervous system (31, 40). Used with due care its value as a control of diagnosis is very considerable.

In chronic attacks investigation of the stools is an important step in the diagnosis but in acute attacks when an urgent decision must be made this would involve too much delay—one or two negative stools are of no significance. Acute surgical conditions must be excluded and in the remainder a provisional diagnosis is made on clinical grounds and subjected in due course to laboratory confirmation. Unless this is obtained before emetine is given the chance of discovering the ameba will probably be lost but in unusually severe attacks immediate treatment takes precedence and the accuracy of the diagnosis is later made evident by the response to emetine.

Acute intestinal amebiasis perforation As previously noted the majority of perforations

occur during the course of an unusually severe attack of intestinal amebiasis occasionally a chronic ulcer perforates in a patient with few or no previous symptoms. It is unnecessary to refer in any detail to the clinical features as they do not differ from those due to other perforations. Severe toxemia from the associated intestinal amebiasis may almost completely mask the clinical evidence of perforation and it is not a very uncommon experience for an unsuspected perforation to come to light at postmortem examination. Arising from a subacute perforation an abscess may develop very insidiously and lead to difficulty in diagnosis especially when the history does not suggest intestinal amebiasis. perirenal collections for example may be mistaken for typhoid malaria empyema and hepatitis (32).

The incidence of clinical perforation is low. Strong reported 3 examples in 200 cases. In our series of 450 cases there was only one perforation which followed exploratory operation in a patient who died from a fulminating infection of the cecum and ascending colon (see Case M. H. following). In the following 200 cases perforations occurred: 1 in the cecum in a patient moribund from a diffuse intestinal amebiasis and the second in a very severe acute infection of the sigmoid which proved fatal despite operation.

When perforation takes place in the course of fulminating attacks the bowel is usually so friable that repair is problematical. Multiple perforations may be found and the toxemia is often overwhelming. The outlook even with surgical interference is very grave indeed. By contrast in chronic and relapsing amebiasis the condition of the bowel is much more favorable and if emetine is not delayed the prognosis approaches that of perforation due to causes (1, 11, 19).

Acute cecal amebiasis. Although there are certain individual features acute cecal amebiasis may be accepted as representative of the localized acute forms of intestinal amebiasis which may affect any part of the large intestine.

When the infection is confined to the cecum the consequences differ from those of the ordinary diffuse form amebic dysentery in many important respects. (a) pain is referred

to the umbilical region and not to the hypogastrium (b) the local signs and local pain are confined to the right iliac fossa (c) diarrhea, blood and mucus are less frequent and not infrequently absent and (d) in general it is more difficult to find the ameba in the stools. This particular difficulty must be recognized or the diagnosis may be overlooked as occurred in some of the published cases (18, 23). Fortunately the response to emetine provides a convenient indication in suspected cases.

For the clinical discussion 3 types of case will be considered: the fulminating, the acute and the special variety, the acute cecal ameboma. All have certain features in common which are presented in Table I.

Fulminating attacks are uncommon. The majority are severe from the start but they may arise as an exacerbation of an ordinary mild intestinal amebiasis. The onset is rapid and abdominal pain, both midabdominal and in the right lower quadrant, vomiting, pyrexia and tachycardia are the prominent features although subject to some variation. Diarrhea may appear either early or late and it is followed by the passage of blood and mucus. The signs of local peritonitis appear early and many patients fail to respond to medical treatment and succumb within a few days to the effects of gangrene or perforation.

A surgical opinion may be required in the less typical attacks. The onset is less abrupt, the toxemia more prominent and the local signs remain more localized in the early stages than in the case of perforation but of course when perforation complicates this type of cecal amebiasis the diagnosis becomes formidable. Appendicitis can be excluded by the toxemia, the wide extent of the local signs in the early stages and the departure from its typical mode of onset and course (Table I). If the diagnosis remains in doubt laparotomy becomes obligatory.

The following case is presented as a fairly typical example.

M. H. aged 9 years. Onset of illness August 6, 1942. Complaining of dizziness, blood and mucus in stool, griping, gurgling, constipation. As his first attack history of mephitic odor, was 99 degrees Fahrenheit. H was treated with 4 drachms of emetine. The stools revealed an indurated

not xult w th blood but no amela or cysts and a cult re was made

At 24 hrs ere l continu pain app r in th right iliac a ith nausea Di rhea was troublesome an h temper t re w s too deg es pulse rate 30 a l respiratory rat 22 per minut Th t ngue wa furr d an l mark d tende nes an l r g dity ere found n th painful area max mal at McBurney's point A lump was f und a d the pro s and thigh r tation tests and rect l examinat on ere n gati To exclude pe f ration or appe dietis exploration was ad ised

At pe tion local pe stonitis v th turbid free fluid a d an ed mato s and c ngested c cum were d slosed Th appendix was in a umilar state and fibrin depos t was seen on both organs Perforatio and gangrene were excluded and the operat as concluded w th the r moval of the appendix h ch was v ry s ollen th oughout and the cont nt we e mucopurulent but the e was no perf tion on gangren o ulceration

The n t l y saw l ttle chang in his e nd t and he v as still passing f equent loose blood sta ed stool app rently fr e from amebae Th culture f the early stool did not e eal any path g n o ganism Lat r h s cond ti n became inc eas ngly s rious Alth ough the dia rhea continued and the stools were f equentl e amined it w s n t til August 15 that the Endamo ba b tolytica was f und a d then in large numbers Em tine a g en to s pplem nt his ulf amid treatment b t w thout effect On August 18 his blood co t ho d red blood c lls—35 mill s hemogl bin go per c t white blood cells 7000 Many deg ne at p l morphonuclear cells were present and some my loocytes a d nucleat d red c lls A blood transf s n wa g ven but the pat nt ded o th n xt d y

Postmortem e aminat on d slosed plasi c pe stonitis with widespre d ecent adhes ns f eep was found i the r ght iliac fossa and in th ght parac le gutt r extend g pwa d t ward the k d ney P was also se b hind th cec m Th appendix st mp was o nd but a pe forano b d occurred in the poste ior su f c of th a ens l g col Th cecu prese t lse eral p iches f gan g r a ith wh l f the la g testi w ft and f alle th sten ve ga gr n f th muc s mem n a lam bic le at on Th cut i flam n at y p oces t f d j a d f hes i t th ileum

This patient was admitted before our laboratory was opened and hi tological examinations were not made Commenting on the case in the light of subsequent experience of amebiasis the cecum was noted at operation to be much more affected than occurs in appendicitis and the possibility of amebiasis might have been confirmed by immediate examination of mears from the contents of the appendix The la y of several l y s be

fore the endameba appeared in the stools is of interest—thi also occurred in several of the recorded cases We would now advise the empirical use of emetine immediately after operation in this type of case rather than await a po sitive stool report Involvement of the ileum has been found in only about 5 per cent of fatal cases of intestinal amebiasis

The acute type of cecal amebiasis is much commoner than the type just described Constitutional disturbance is slight nausea and vomiting unusual diarrhea rarely prominent and abdominal pain is not excessive The local signs tend to be disproportionally well marked Complications are infrequent and a response to emetine is to be expected within 3 days Further details appear in Table I

Involvement of the appendix by extension from the cecum is probably of frequent occurrence as already noted in the remarks on pathology From the clinical point of view this extension is of little consequence because both cecal amebiasis and amebic appendicitis are essentially medical diseases clinically indistinguishable usually responsive to medical treatment and unsuitable for surgery unless complicated by abscess or perforation (12) L ycephonal attacks do not react to emetine as in the following example

A J aged 24 years was admitted n S pteml r 9 942 suffering from dys ntery which had com m need 6 weeks p v sly in th form of a mld d a he later replaced by ery freq ent stools with blood a d mucus This was h first attack Wh n exam ned he complained of interm tent pains in both il c regions b t apart fr m tend ness ther no abnormality was f nd The stools contain d E damoeb hist lytica nd emet e a d carb s ne were g n Although the diarrh a was r lie ed and th ameba d appeared fr m the stool inte mittent p na occur d no in the umbilical and r ght iliac r gions Th attacks took pl ce three or four t mes a day lasting f an hour or so at a t me The app tit w poor b t there was n nausea r vomiting

The t clks er d severity and w lln a kel tendernes d l ped in th ri ht ilac fossa and t much less r deg e pers t n the left s de o er the s gmoidea d descend g colon The e was n r g d ty and n m a s Rpeat d stool xaminat n wer n gative nd tw s gmo locopies al o howed n b rmalty On Oct be 31 he had an att ck of gr at r r ty than befo e and perat wa d s d

Laparot my re ealed n d m t us inj ct d appendix with ft th ck w ll a d the a l y cent

TABLE I.—CLINICAL FEATURES OF ACUTE CECAL AMEBIASIS AND DIAGNOSIS FROM ACUTE APPENDICITIS

Acute Cecal Amebiasis				Acute Appendicitis			
<i>Parasitology</i>				<i>Parasitology</i>			
Often presents itself as a mild, non-specific abdominal pain, usually in the right lower quadrant, with a gradual onset and a tendency to persist.				Often presents itself as a more severe, localized abdominal pain, usually in the right lower quadrant, with a rapid onset and a tendency to persist.			
The pain is usually accompanied by a low-grade fever, a loss of appetite, and a general feeling of malaise.				The pain is usually accompanied by a more pronounced fever, a loss of appetite, and a general feeling of malaise.			
The stool may contain mucus and blood, and the patient may experience a sense of rectal fullness or discomfort.				The stool may contain mucus and blood, and the patient may experience a sense of rectal fullness or discomfort.			
The diagnosis is usually confirmed by the presence of trophozoites in the stool, which may be identified by microscopic examination.				The diagnosis is usually confirmed by the presence of trophozoites in the stool, which may be identified by microscopic examination.			
<i>Pathology</i>				<i>Pathology</i>			
The disease is caused by the invasion of the cecum by the trophozoites of <i>Entamoeba histolytica</i> , which may be identified by microscopic examination.				The disease is caused by the invasion of the appendix by the trophozoites of <i>Entamoeba histolytica</i> , which may be identified by microscopic examination.			
The trophozoites may be found in the stool, the cecum, and the appendix, and they may cause a localized abscess or a more extensive infection.				The trophozoites may be found in the stool, the cecum, and the appendix, and they may cause a localized abscess or a more extensive infection.			
The disease is usually self-limiting, and the patient may recover without the need for surgery.				The disease is usually self-limiting, and the patient may recover without the need for surgery.			
<i>Diagnosis</i>				<i>Diagnosis</i>			
The diagnosis is usually confirmed by the presence of trophozoites in the stool, which may be identified by microscopic examination.				The diagnosis is usually confirmed by the presence of trophozoites in the stool, which may be identified by microscopic examination.			
The disease is usually self-limiting, and the patient may recover without the need for surgery.				The disease is usually self-limiting, and the patient may recover without the need for surgery.			
<i>Prognosis</i>				<i>Prognosis</i>			
The prognosis is usually good, and the patient may recover without the need for surgery.				The prognosis is usually good, and the patient may recover without the need for surgery.			
The disease is usually self-limiting, and the patient may recover without the need for surgery.				The disease is usually self-limiting, and the patient may recover without the need for surgery.			
<i>Treatment</i>				<i>Treatment</i>			
The treatment is usually conservative, and the patient may recover without the need for surgery.				The treatment is usually conservative, and the patient may recover without the need for surgery.			
The disease is usually self-limiting, and the patient may recover without the need for surgery.				The disease is usually self-limiting, and the patient may recover without the need for surgery.			
<i>Prevention</i>				<i>Prevention</i>			
The prevention is usually conservative, and the patient may recover without the need for surgery.				The prevention is usually conservative, and the patient may recover without the need for surgery.			
The disease is usually self-limiting, and the patient may recover without the need for surgery.				The disease is usually self-limiting, and the patient may recover without the need for surgery.			

TABLE I—CLINICAL FEATURES OF ACUTE CECAL AMEBIASIS AND DIAGNOSIS FROM ACUTE APPENDICITIS—Continued

Acute Cecal Amebiasis

Acute Appendicitis

Leucocyt									
Depressed	stuffy	throat	moderate	sewer	thick	inflammation	type	febrile	rise to moderate
usually	difficult	to swallow	moderate	sewer	thick	inflammation	type	febrile	rise to moderate
usually	difficult	to swallow	moderate	sewer	thick	inflammation	type	febrile	rise to moderate
usually	difficult	to swallow	moderate	sewer	thick	inflammation	type	febrile	rise to moderate
usually	difficult	to swallow	moderate	sewer	thick	inflammation	type	febrile	rise to moderate
usually	difficult	to swallow	moderate	sewer	thick	inflammation	type	febrile	rise to moderate
usually	difficult	to swallow	moderate	sewer	thick	inflammation	type	febrile	rise to moderate
usually	difficult	to swallow	moderate	sewer	thick	inflammation	type	febrile	rise to moderate
usually	difficult	to swallow	moderate	sewer	thick	inflammation	type	febrile	rise to moderate
usually	difficult	to swallow	moderate	sewer	thick	inflammation	type	febrile	rise to moderate

ecum present darkened and indurated surface. The abdomen is distended and exploration discloses rather pathologic. On removal of the appendix contained mucous and the mucosa was very swollen and howd numerous small areas of hemorrhage with trauma from handling had been educed to a mass. The caliber of the lumen was much reduced by the edema. Microscopic examination of the contents showed pus cells, red blood cells and mucus. Histology of the mucosa showed the ulceration of the mucosa and in and beneath the mucous masses of numerous leucocytes and eosinophils. The eosinophilic cells comprised about 1/3 of the total cells observed. Although structures bearing a close resemblance to Endamoeba histolytica were seen and beneath the mucosa their identity was not established when a hematoxylin stain was used.

Further metacarcinoma, e.g., cancer as not clinically satisfactory in the diagnosis of the complaint of pain rather than in the food to be modified. This attack soon subsided for about 3 weeks. He complained of intermittent colicky pains in the mid abdomen. In the next 2 weeks a further sigmoidoscopy showed inflammation of the sigmoid colon when he was treated for constipation.

This appears to have been an example of amebic appendicitis even though the Endamoeba histolytica was not found in the actual tissues. Although examinations of the stools and sigmoidoscopy repeatedly proved negative evidence of amebiasis of both cecum and appendix was found at operation.

The third condition for discussion with acute cecal amebiasis is the acute cecal ame-

boma which is occasionally found when resolution of an acute attack of cecal amebiasis is delayed and is more likely to develop if emetine is omitted. In the early stages tenderness and rigidity tend to obscure the mass later when the tenderness is less and the rigidity disappears it is more easily defined. The temperature and pulse are little affected and even in the presence of a large mass which may involve the ascending colon the constitutional disturbance is rarely severe. Exacerbations are not uncommon and are accompanied by an increase in the local signs and a moderate rise of temperature and pulse. A slight rise in the leucocyte count of the type noted in Table I is usual.

However suggestive an abdominal mass may appear of appendicitis in patients who have lived in endemic areas before operation is advised investigation should be undertaken to exclude amebiasis. In our experience sigmoidoscopy is not often helpful in this condition and repeated examination of the stools quite commonly proves negative. The response to emetine is very much more constant but if this fails laparotomy will be required for diagnosis. The following case of ameboma presented some interesting features.

In September 1942 D. J. aged 30 years was treated with emetine grains and sulfanilamide for a diagnosis of mebicosis. He was admitted to hospital on December 8, 1942 because of rather harsh Endamoeba histolytica.

was found in the stools and emetine and calomel were given with complete relief of symptoms. On January 6 amebic cultures (therapeutic) confirmed by examination of the discharge showed good oscopy. Quinacrine was given both orally and by the rectum but although the diarrhea did not recur a serious deterioration in his general condition set in for which detailed investigation failed to find a cause. On February 6 he came to the hospital for an examination and a mass was discovered. A surgical opinion was obtained to exclude appendicitis. The swelling was tender and fixed and about the size of a closed fist but there was no rigidity. He was almost slightly tender in the left iliac fossa and the rectum was slightly tender in the rectum. Other investigations showed general conditions were negative and the diagnosis of ameboma was accepted.

During the next week the temperature and pulse failed to settle and there was no change in his condition except for the appearance of a more degree of rigidity and some increase in the mass. On February 12 emetine was resumed a week later a very remarkable reduction had occurred in the mass although the diarrhea with blood and amebae had returned. Quinacrine and carbazone were prescribed and a great improvement in general condition followed. By the end of February the swelling was again of cecal thickening. During March he had moderate abdominal pain again with diarrhea and amebae in the stool. A final course of emetine, carbazone and quinacrine was commenced on March 8 and when he was transferred to another hospital on April 9 for treatment his general condition was much improved.

Relapse after emetine even when supplemented with other drugs is not uncommon. Emetine bismuth iodide was not available at the time and it was only after every consideration that the physicians prescribed emetine to the extent of a total of 41 grains. Serious constitutional disturbance is unusual with ameboma and it is probable that some other agent was responsible in this case.

The diagnosis of acute cecal amebiasis from appendicitis. More than 30 years ago Rogers (35) described cecal thickening in cases of amebic dysentery which simulated appendicitis and which he had seen mistaken by physicians and surgeon and in which the appendix proved not to be involved. Many surgeons have been interested in this problem and there is ample evidence to support the view that surgeons who work in tropical countries have found that they must be constantly on their guard to avoid operation in cases of amebic dysentery under the diagnosis of appendicitis (6, 1, 23). Even in temper-

ate climates the same difficulty may arise as was witnessed during the Chicago epidemic of 1933-1934 when of 113 cases of amebic dysentery 32 were diagnosed as appendicitis and submitted to operation.

In the remarks which follow no special reference will be made to amebic appendicitis as this is merely an extension of the infection from the cecum. The immediate diagnosis of acute cecal amebiasis is essentially clinical and laboratory confirmation must come later. As a general rule there is little difficulty in diagnosis—especially when there is evidence of involvement of the more distal colon or liver. When the disease is confined to the cecum the distinction becomes finer and occasionally the disease so closely simulates appendicitis that recognition is not possible by the clinical method at our disposal. Surgeons necessarily meet a high proportion of the more difficult cases but on account of the special risks of operation on the amebic abdomen every effort should be made to arrive at a diagnosis without resort to laparotomy although this must be advised if there is serious doubt.

The individual items of diagnosis are presented in Table I but a few general observations will be added.

The manifestations of acute cecal amebiasis are much less constant than those of appendicitis and even when there is considerable resemblance it is usually possible to recognize some essential feature which cannot be integrated into the typical pattern of appendicitis. On the other hand the unexpected irregular attack of appendicitis is in the tropics very liable to be mistaken for dysentery especially if the typical history is lacking. In the high retrocecal position with comparatively mild symptoms appendicitis may suggest amebiasis of the cecum or in the pelvic position with hypogastric pain it may lead to a suspicion of dysentery affecting the distal colon. Acute appendicitis associated with diarrhea is of course a well known trap.

In distinguishing these conditions in which the clinical features may be so similar success often depends on details—detail of the previous history of any premonitory symptoms of the onset and progress of the attack and of

the individual signs and symptoms. Rayner's observation the old dictum quick in and quicker out has long since been obsolete. Always there is time to make a considered diagnosis as there is to do a careful and gentle operation (34); even more applicable to the diagnosis of appendicitis in the tropics than in temperate climates and in any case of suspected appendicitis amebiasis must always be excluded.

The local signs of acute cecal amebiasis commonly appear earlier and are at first more diffuse than those of appendicitis but they are by no means constant and not infrequently appear most suggestive of acute appendicitis. A common error is to exaggerate the importance of the local physical signs while neglecting the general aspects of the case. We have seen many examples of amebiasis diagnosed as appendicitis on this account. Failure to appreciate that the onset of an attack of cecal amebiasis may be very abrupt and that diarrhea is frequently absent during the first few days are other causes of misdiagnosis.

As already noted the individual signs and symptoms in amebiasis are much less constant than those of acute appendicitis; this inconstancy applies also to the order of their appearance. In acute appendicitis exceptions to the rule. First and all the time the pain next nausea then tenderness and finally fever with leucocytosis are remarkably rare (9-20) but in acute cecal amebiasis no set order applies.

Occasionally acute abdominal pains develop during the course of an attack of amebic dysentery and center in the right iliac fossa. The differential diagnosis then includes (a) an exacerbation of cecal amebiasis with or without extension to the appendix (b) nonamebic acute appendicitis and (c) perforation of an amebic ulcer. The diagnosis of perforation will not be considered further. The evidence may be sufficient to enable a definite diagnosis to be made in the more severe attacks of nonamebic appendicitis especially of the obstructive variety or at least to leave no doubt about the necessity for exploration. More often it is less convincing and a frequent result of exploration under these conditions has been the discovery of acute amebiasis of the cecum and at times also of the appendix but not a surgical

appendicitis (1). In the clinically less severe attacks any bias should be in the direction of amebiasis.

The indications for operation in the doubtful case. When the diagnosis remains in doubt two considerations must be weighed in the balance the dangers of postponing operation in acute appendicitis and the peculiar risks of operation in intestinal amebiasis. (The reader is referred to the section Operations in Relation to Intestinal Amebiasis which follows.) The danger of delay in appendicitis needs no comment and examples of apparently mild attacks which at operation prove to be much more serious are by no means rare. Nevertheless when amebiasis is the alternative diagnosis with the attendant risks from operation a conservative attitude may well be the safer policy if all the clinical evidence points to a mild attack.

If a severe attack of appendicitis cannot be excluded with reasonable certainty exploration must be advised. For the obviously mild attack and the attack which appears to be settling down conservative measures with emetine should be given a trial. When acute symptoms develop during an attack of amebic dysentery exploration is indicated if the attack is clinically severe but with less severe symptoms the bias should be against operation. When there is a localized mass in the right iliac fossa whether the cause is ameboma or acute appendicitis there is no indication for immediate interference the attack should be treated conservatively with emetine. Operation is required only if an abscess develops or if the mass persists when it becomes necessary to exclude such lesions as tuberculosis ileitis and carcinoma.

In perspective. Attention has been focused on acute cecal amebiasis and its diagnosis from acute appendicitis. Amebic infections may of course localize in other parts of the large intestine with effects analogous to those described. The possibility of other important diseases which may present a similar clinical picture must not be overlooked. These include malaria hepatitis both amebic and infective typhoid cholecystitis ulcerative colitis and some forms of bacillary dysentery all may give rise to acute abdominal symptoms

which may concentrate in the lower right quadrant of the abdomen. Their salient features are well known and will not be described.

CHRONIC INTESTINAL AMEBIASIS

Amebiasis and chronic appendicitis The high incidence of amebiasis among soldiers serving overseas and its tendency to persist for long period and to relapse make this subject exceptionally important. After the war postdysenteric abdominal disorders will undoubtedly appear frequently in general surgical practice. For purpose of discussion patients may be divided into two groups: (a) those who have lived in endemic areas but give no history of infection and (b) those who have had intestinal amebiasis.

In the first group the possibility of unsuspected intestinal amebiasis as a cause of the symptoms must not be overlooked. However suggestive the case may be of appendicular disease, operation is not to be advised until amebiasis has been excluded by adequate investigation. Clinical features which suggest amebiasis are a characteristic diffuse rather than localized thickening of the cecum, a tender firm sigmoid colon, and tenderness or enlargement of the liver. Tenderness and thickening is sometimes present over other parts of the colon. Investigation will include frequently repeated examination of the stools, sigmoidoscopy, and x-ray examination—this may reveal unsuspected disease in the colon. If after complete investigation there is no evidence of amebiasis, operation will be advised on ordinary surgical principles.

In the second group of patients symptoms are often too readily assumed to be the result of chronic inflammatory changes in the appendix caused by the attack of dysentery for which operation is necessary. It is important to remember that the patient having already had dysentery is liable to relapse or may have been reinfected and symptoms which are very suggestive of appendicitis may be produced. In addition however the possibility of postdysenteric intestinal symptoms of nonappendicular origin must be considered. Such symptoms may be due to a neurosis or to functional disturbances of the bowel or to organic changes such as scarring and adhe-

sions attributable to the previous dysentery. Dyspepsia, anorexia, abdominal discomfort, irregularity of the bowels, and pain and tenderness in the right iliac fossa may be very suggestive of appendicular disease but more often result from one of the other conditions. Even if the appendix is at fault the lesion may be an amebic appendicitis which may well respond to medical treatment. Moreover many patients given time recover spontaneously. For patients who fall into this group if there is a history of recent dysentery, observation for some months is advisable before operation is resorted to, and in all cases the question of a trial of emetine or other amebicide should be considered by a physician.

(Banerji and Chopra recommend an interval operation for every case in which the appendix appears to be acutely involved during the course of an attack of cecal amebiasis. They state that patients are liable to subsequent attacks of appendicitis either as a result of chronic inflammatory changes in the appendix or a recurrence of amebic lesions in the appendix. It is not unusual to find gross changes of the type noted in the section on pathology in appendices removed at interval operation but we would recommend operation for amebic appendicitis only when every effort to cure the condition by medical measures has failed—unless of course some complication intervened. At present interval operation following acute cecal amebiasis is usually reserved for cases in which evidence of appendicitis persists after apparent cure of the cecal amebiasis. There is need for further investigation on this point because Banerji and Chopra base their opinion on an extensive experience.)

Finally attention is directed to the unsatisfactory results which follow indiscriminate appendectomy in endemic regions. Rogers disclosed that a considerable number of chronic dysenteric patients were found by the India office to have had their appendices removed without lasting benefit (36). If a repetition of this experience is to be avoided, appendectomy must be reserved for carefully selected patients.

Localized chronic amebic lesions of the cecum and colon The diffuse form of amebic colitis

which may simulate chronic appendicitis, cholecystitis and duodenal ulcers is well known but the localized lesion with solitary or multiple ulcers, thickening of the bowel and often a palpable mass has received little attention in general surgery. It is a rare lesion and the counterpart of the ameboma which occurs in the acute state and like it is of surgical interest chiefly because it is so liable to be mistaken for a surgical condition. Occasionally the disease causes an obstruction which requires operation. Typical cases have been described in the literature (15, 18, 32, 37, 43) and the difficulties of diagnosis and the dangers attendant on operation in unsuspected cases are well described. These dangers were clearly revealed during the Chicago epidemic and no doubt the publicity which followed ensured their wider recognition. However the time has not yet arrived when a majority of surgeons would subscribe to Simon's experience whereas the previous tendency was to overlook amebiasis and to diagnose carcinoma or tuberculosis now the tendency is in the opposite direction.

The clinical features require no elaboration and will be referred to in general terms only in order to emphasize their close similarity to those of other granulomas and neoplasms of the bowel. In all the effects depend on the portion of the intestine involved, the extent of the ulceration and the degree of mechanical obstruction. As is well known while in lesions of the lower part of the colon alternating diarrhea and constipation and the passage of blood and mucus are usual in the midcolon obstructive symptoms are likely to predominate. In the proximal colon especially in the cecum a mass of considerable size may develop silently as far as bowel symptoms are concerned although reflex gastrointestinal symptoms may occur. Palpation may reveal the presence of a mass and radiological examination will define its position and extent. A history of previous dysentery would merely indicate the necessity of special investigation.

It is generally agreed that radiological appearances are not pathognomonic of this condition. Deformities of the cecum due to contraction and induration such as a coned appearance have been described but they are

neither constant nor distinctive (27). Deformity of the colon from ulceration or fibrosis may be marked but cannot be distinguished with certainty from other inflammatory or malignant conditions. Extensive deformity would support the diagnosis of amebiasis but Ikeda's opinion that the chief value of radiology is the diagnosis of the site and extent of these lesions and as a control of treatment represents the limitations of the method.

Differential diagnosis from carcinoma, tuberculosis, diverticulitis and rarer conditions such as regional ileitis, actinomycosis and chronic bacillary lesions involves the accepted clinical, radiological and laboratory investigations and may provide conclusive evidence of one or other of these diseases. In this variety of amebiasis neither clinical nor radiological features are distinctive and diagnosis depends on the discovery of the ameba and the diagnostic use of emetine.

The detection of the *Endamoeba histolytica* in the stools may prove difficult and the greatest importance is attached to the details to be observed in the selection of specimens for examination and the immediate examination of fresh specimens on several successive days (25). Sigmoidoscopy may succeed when the stool tests fail but as would be expected the percentage of positive results will be small when the proximal colon is affected. Finally, emetine should always be employed for the diagnosis of tumors of the large intestine in patients who have lived in endemic areas whether the *Endamoeba histolytica* has been isolated or not. The effect should be assessed not only by clinical laboratory and radiological examinations but also when applicable by sigmoidoscopy. Most amebic lesions respond conclusively but in some of the fibrous forms emetine has little effect. In view of the possible coexistence of other lesions if complete resolution is not obtained biopsy or excision then becomes necessary.

Two cases will be described to illustrate some of the points raised.

✓ M. E., an officer's wife aged 32 years was seen in consultation as a patient on November 1942. She complained of pain in the right iliac fossa off and on for about 2 months and of occasional mild fever and some loss of weight. Her appendix had

been emended when she was 8 years old and at 27 she had amebic dysentery. She had recently been investigated in the hospital where a mass was discovered in the cecal area. The stools were negative and x-ray showed irregularity of the cecum and sigmoid in emptying of the ileum. She had been admitted to hospital for tomy on the provision of diagnosis of tuberculosis. On examination there was found a slightly tender mass corresponding in size and position with the cecum as seen in the x-ray picture. No other abnormality was noted. She was diagnosed to have ileitis in the sigmoid before surgery. Operation was performed while awaiting admission. She developed another attack of amebic dysentery. Six weeks later after routine treatment he weight had increased. Abdominal symptoms were almost completely relieved and the weight was gained. The patient is in the right of health.

✓ L. H. aged 5 years was admitted on February 23, 1944 with diarrhea and vomiting of about 12 hours duration. He had suffered from intermittent attacks of diarrhea, flatulence and colic for about 3 months and considerable loss of weight.

Bacillary dysentery was at first suspected but since mucus only brought partial relief the diagnosis was the stool culture showed blood and tenesmus, inflammatory exudate but no mucus. Antileishmaniasis and in the right hypochondrium. He was later found to have stool examinations result of the discovery of Endamoeba histolytica. He began to eat and gained weight on February 23. After a course of emetine his general condition was considerably improved and the diarrhea was completely relieved but the mass remained unaffected. An x-ray examination of the barium showed a constant filling defect of the ring type in the right half of the transverse colon. Repeated examination of the tissues and sigmoidoscopy produced no evidence of amebiasis.

At operation on March 8 for suspected carcinoma a wedge resection of the terminal ileum, cecum and colon was performed for a tumor in the site indicated by x-ray film. The microscopic findings were definitely enlarged but there was no sign of metastasis. The remaining distal ileum and colon were used to provide a colostomy.

The specimen presented a typical carcinoma of the ulcer. Almost encircling the bowel and three millimeter ulcers of the stercoral type. Scrapings from the ulcers failed to show amebae and microscopic examination of the ileocecal colon mucosa showed carcinoma with inflammatory changes in the glands. Colonic ulcer was ventral and deep. Six weeks later the colostomy was successfully closed.

AMEBIASIS OF THE RECTUM AND ANAL CANAL

Amebiasis of the rectum and anal canal will be considered in two parts: amebiasis in relation to simple conditions such as piles, fissure, fistula and fibrous stricture and amebic conditions simulating neoplasm.

The piles both internal and external which so commonly accompany an attack of amebic dysentery usually resolve as the dysentery is brought under control although in exceptional cases operation is required at a later date. Prolapse acts in a similar manner. Piles due to mild or chronic dysentery are of greater surgical importance for the dysentery may be far from obvious and operation may be advised (17). Such cases are potential surgical catastrophes and interference may be followed by an acute exacerbation of the dysentery—a most unwelcome sequel to a rectal operation—and by severe local complications and even by liver abscess. McCoy reports that 6 patients suffering from dysentery during the Chicago epidemic were submitted to operation for piles, one of whom died.

In our experience in an endemic area among the patients referred to hospital for the treatment of piles and fissures many were found to have amebic dysentery or amebic proctitis. There was often no history to suggest dysentery and some patients had been cured of this condition in the past. Proctoscopic examination alone is not sufficient and sigmoidoscopy and repeated stool examinations may be required to bring to light the less obvious amebic infections. It is thought that postoperative troubles such as ulceration and scarring which appear to be more liable to occur in the tropics than in temperate climates are often caused by unsuspected dysentery.

Among the less common complications of amebiasis are conditions such as fistula in ano, anorectal abscess and perianal ulceration. It is often not possible to find the ameba in the discharge but examination of scrapings from the walls of the cavity is more successful. Biopsy may be used to establish the diagnosis although in most cases spectacular confirmation is provided by the response to emetine.

Jackman noted the low incidence of fistula and anorectal abscess in this disease and contrasted his figure of 1.7 per cent with the 30 per cent be found in cases of regional ileitis and 8.4 per cent in ulcerative colitis. Two instances of fistula in ano occurred in our series. Extensive perianal ulceration was commonplace before the introduction of modern treatment but is rarely seen today and on

that account the diagnosis may be missed in chronic cases. Gabriel described a remarkable example in which wide pread amebic ulceration followed the rupture of an anal abscess in a patient who gave no history of dysentery the condition responded to emetine. One of our patients seriously ill with longstanding amebic dysentery developed an extensive perianal ulceration with much overgrowth of granulation tissue which was very suggestive of condylomas in appearance. The Wassermann reaction was negative and the condition ultimately resolved completely without contraction on treatment with emetine carbazon quinoxyl and simple local applications.

The following cases are of relevant interest.

J. T. aged 35 years was admitted for operation for piles in September 22 1942. There was no history of dysentery and apart from a mass of internal hemorrhoids proctoscopy showed no abnormality. The operation of excision and ligation was performed and progress was satisfactory until the end of the second week when he complained of pain in the right shoulder and right hypochondrium. The operation on the rectum was almost healed but the liver as well as the lungs showed a remittent pyrexia without rigors. Blood counts showed a leucocytosis with a slight eosinophilia and a differential leukocyte count showed a relative increase in the polymorphonuclear cells. The patient was given a course of penicillin and the pyrexia subsided. The patient was discharged on October 16 and on reoperation was performed in the postoperative period. The patient was discharged on October 16 and on reoperation was performed in the postoperative period. The patient was discharged on October 16 and on reoperation was performed in the postoperative period.

This patient was admitted before repeated examinations of the stools and sigmoidoscopy were adopted as a routine preoperative measure in cases of piles although it may be noted that after operation and before emetine was given the stools were negative.

Nevertheless it seems probable that the abscess was related to his operation.

J. F. D. aged 35 years was admitted in August 1943 in a very toxic condition and complained of severe abdominal pain and diarrhea. Blood examination of the rectum revealed the presence of amebae. The patient was treated with emetine and the symptoms subsided. The patient was discharged on July 7 1943 and later he felt

very poorly but as he was engaged in jungle training he tried to carry on. Eventually he reported to his doctor who noted that his temperature was 103 degrees and sent him to hospital.

On examination apart from his rectal condition there was found no abnormality for his high fever and to emetine. The white blood count was 20,916 (polymorphonuclears 78 per cent leucocytes 21 per cent). On microscopic examination of the rectal discharge blood and pus were seen but no sign of amebae. An anasthetic was necessary to permit examination of the rectum. Potassium permanganate solutions were excluded. Very inflamed piles were seen and the whole area within range of the proctoscope was intensely congested. Smears were examined with the same result as before.

Sulfonamide treatment failed to reduce the toxemia and on August 13 a sigmoidoscopy was performed. On account of the intense infection examination was restricted to the anal canal and lower part of the rectum. On this occasion smears taken from the rectal walls were found to contain the Endamoeba histolytica. Emetine was rapidly effective and a fortnight later sigmoidoscopy revealed no evidence of inflammation.

This exceptional case illustrates the grave danger which may attend even such a minor surgical procedure in the presence of an amebic infection.

Fibrous stricture. Contrary to earlier opinion the view is now held that amebic dysentery rarely produces fibrous stricture of the rectum. It is often impossible to determine the nature of the infection concerned for apart from conditions such as syphilis and lymphogranuloma stricture may follow many varieties of proctitis due to non-specific causes. Even when strictures result from amebic infections the identification of the ameba may present great difficulty.

The only example of fibrous stricture of the rectum which occurred in our series was found in the following patient.

W. D. aged 28 years who was admitted for proctitis in July 1943. After treatment with emetine carbazon and quinine he complained of increasing difficulty in passing motions. It was found to have a double stricture affecting the upper part of the anal canal and lower part of the rectum in which as clear fibrous and would only admit the little finger with difficulty. The remittent diarrhea continued in a great improvement. Although ulceration was found between the strictures amebae could not be detected. The craps from the stricture were the tool. Biopsy disclosed non-specific chronic inflammation with changes only at the Waldeyer's ring.

negative certain cause established to account for the structure

Amebic lesions of the rectum simulating neoplasm In intestinal amebiasis of long standing multiple polypoidal excrescences of granulation tissue or edematous mucosa are sometimes seen at sigmoidoscopy and may be mistaken for simple neoplasms. They usually disappear when emetine is used—if not biopsy will be required for diagnosis.

In recent years attention has been focused on the chronic amebic ulcer or area of granulation tissue which may assume the clinical appearances of carcinoma of the rectum (27, 3, 43). Typical amebic ulcers are occasionally seen at a higher level but in many cases the lesion exists alone. A short history, extensive involvement of the rectal wall and absence of the typical induration of carcinoma are suggestive of amebiasis but frequent examples occur in which the clinical features cannot be distinguished from those of malignancy. Differential diagnosis includes the discovery of the ameba in the stool or in scrapings from the ulcerated surface but the possible coexistence of carcinoma demands close observation of the effects of emetine and occasionally biopsy.

This type of amebic lesion is to be expected from time to time among soldiers on their return home from endemic areas—the writer saw 6 examples during a period of 3 years in India—and on that account 2 typical cases will be described.

During the withdrawal from Burma H. S. aged 35 years developed abdominal pain and diarrhea. He was admitted to a hospital in Arrah in India. The diarrhea had subsided but inflammation was found in the right iliac fossa which persisted for some weeks and appendix abscess was diagnosed. Eventually a sentinal ulcer and appendicitis were recommended when he was fit. While in the hospital the pain and diarrhea returned and he was admitted to another hospital. There the possibility of a pelvic abscess was at first considered on account of a moderate fever and the passage of blood-stained mucus which did not reveal amebae. When the surgical possibilities were excluded a mass in the rectum which was very suggestive of carcinoma was found. When seen on October 5, 1941 he was still suffering from diarrhea with an intermittent blood-stained discharge. He had lost weight and his abdominal

examination was negative but on rectal examination the lower edge of an indurated mass was felt above the internal sphincter and about 15 cm irregular ulcerated surface extended out from the finger. Sigmoidoscopy disclosed an ulcer occupied the anterior and lateral walls of the rectum between the third and fourth inches from the anal. Encroachment on the lumbar and rectal passages of the instrument difficult but the upper extremity appeared normal. Both clinical examination and sigmoidoscopy the condition was indistinguishable from carcinoma. Scapings from the ulcer showed blood and pus but no amebae but as the mass melted before the specimens were examined further specimens were taken on the next day. A limited distal examination disclosed considerable numbers of amebae in the stool.

The treatment with emetine was rapidly effective. Diarrhea was relieved and weight and strength regained. Repeated sigmoidoscopy confirmed the clinical improvement and within a month the rectum had returned to normal. The patient was advised to have his appendix removed at a later date although it appeared probable that his appendix abscess was in reality an amebic infection.

J. L. aged 2 years was in hospital on occasions in the year 1941 for amebic dysentery. A history responded to treatment with emetine, calomel and quinine. He was readmitted on July 16, 1943 for a recurrence. The amebic dysentery was again found in the stool. Chills and pot-smell with mucus (Indian equivalent of emetine bismuthoid) were produced with the stools continued loose they were again found amebae on February 8 and 1. Sigmoidoscopy on February 13 disclosed an ulcer with thick edge and an irregular ulcer covered with blood and mucus occupying about the fourth of the circumference of the rectum. A histological examination of the internal sphincter. The ulcer extended posteriorly about an inch and to the left and the naked eye might well have been misled. The high rectal abscess of the bowel appeared in the sigmoidoscopy from the surface of the ulcer contained Endamoeba histolytica. Emetine was given and dissolved in mucus appeared in the stool. After 12 grains had been taken in three weeks again normal. The treatment was completed and sigmoidoscopy on March 13 the patient was in good health and the slight tendency to bleed at the site of the ulcer had disappeared. On March 13 a further sigmoidoscopy performed to determine the

A NOTE ON SIGMOIDOSCOPY

Apart from the obvious advantage in appropriate cases of obtaining a specimen for diagnosis directly from the surface of an amebic ulcer or for histological examination sigmoidoscopy provides a valuable method of confirm-

ing the effects of emetine when used for diagnostic or therapeutic purposes and for the exclusion of other lesions such as carcinoma which may coexist with amebiasis.

We have frequently found the *Endamoeba histolytica* in specimens at sigmoidoscopy when the stools had proved repeatedly negative and have discovered still active ulceration when all other evidence indicated a complete cure from treatment. Jackman advocates routine sigmoidoscopy for every case in which amebiasis is suspected on the grounds that the occasional coexistence of neoplasm is sufficiently frequent to warrant this step. The method is included as part of the routine investigation of amebic dysentery in British Military Hospitals in the East.

Various estimates have been given of the percentage of cases of intestinal amebiasis in which lesions may be found at sigmoidoscopy. Manson Bahr reports at least 80 per cent while Jackman's figure is 20.8 per cent. The surgeon is more concerned with a selected group of cases in which the lesion is localized and on that account the method is most useful in rectal and sigmoid lesions. We have had positive results in about 10 per cent of attacks which on clinical examination appear to be confined to the cecum.

For a description of the methods of preparation the sigmoidoscopic appearances of amebiasis and their differential diagnosis the reader is referred to publications by Manson Bahr and Biggam (4, 26, 27).

OPERATIONS IN RELATION TO INTESTINAL AMEBIASIS

Operations which involve disturbance to the bowel which has been infected by the *Endamoeba histolytica* are liable to be followed by certain complications related to this infection. A brief summary is presented.

Acute exacerbation of amebic dysentery. A localized amebia may be transformed into a diffuse type occasionally of great severity. After intestinal suture and rectal operations the effects at the site of operation may be serious.

Local and distant septic complications. These are common and may prove fatal. Many examples appear in the literature of

conditions such as pericolic abscess, gangrene of the bowel, peritonitis and hepatic abscess in some of which the appearances at operation gave no cause for alarm.

Intestinal hemorrhage. Barry and Crump and Cope have emphasized the special risk of hemorrhage from amebic ulcers after operation, most commonly in cases of cecal amebiasis.

Delay or failure of the normal repair processes. Prolonged delay in healing and spreading ulceration of the abdominal wall were often seen before the introduction of emetine and may occur in examples of unsuspected amebiasis. Failure at the suture line in cases of anastomosis figures prominently in the published cases. Possibly the lack of round celled and fibroblastic reaction which is found in certain circumstances in amebic infections is related to the incidence of these complications.

These dangers are well known and a surgeon's individual experience is therefore limited. Three examples are described in this paper: a case of fulminating cecal amebiasis and 2 rectal cases but other examples have occurred among surgeons of our acquaintance. The most convincing evidence is presented in the reports of the Chicago epidemic although it should be noted that the incidence of severe attacks was exceptionally high. In the early stages the number of deaths following operations for suspected surgical conditions as compared with such proportions that the Public Health authorities found it necessary to take exceptional measures to advise doctors in the wide area concerned on the diagnosis and treatment of amebiasis (5). The mortality of the 1215 cases traced was 7 per cent. McCoy reports 13 deaths among 32 patients submitted to appendectomy and other deaths after operation for cholecystitis and carcinoma of the colon. In all these cases amebiasis had not been diagnosed. In 50 per cent of the fatal cases mistaken diagnoses were reported and in more than two-thirds of these the ulcers had been handled as a surgical disease. In no instance did a fatality follow early consultation, prompt diagnosis and specific treatment (28).

In spite of these dangers exploratory operation is occasionally necessary, as for example when the diagnosis between cecal and amebic

doubt if there is strong suspicion of this disease at operation it is unwise to delay its use until positive evidence is forthcoming

SUMMARY AND CONCLUSIONS

Intestinal amebiasis is the disease of major surgical importance in endemic areas. With the return of the forces from the East examples of this disease must be expected in general practice at home.

The clinical and radiological manifestations of the localized forms of intestinal amebiasis may be indistinguishable from those of surgical diseases, acute or chronic. It is usually but not always possible to find the *Endamoeba histolytica* in the stools, sigmoidoscopy may succeed when examination of the stools fails. The response to emetine is of considerable diagnostic significance but occasionally the condition is resistant to the drug and exploration or biopsy is then required. The possible coexistence of amebiasis with other lesions must not be overlooked.

Perforation of an amebic ulcer is to be expected in less than 3 per cent of cases. It is most often associated with fulminating infections. Toxemia may mask the clinical signs and if gangrene is present recovery even with operation is very unlikely.

The clinical features of acute cecal amebiasis and acute appendicitis have much in common; the differential diagnosis may present great difficulty but in view of the special risks of operation in cases of cecal amebiasis every endeavor should be made to obtain a clinical diagnosis. If exploration proves necessary manipulation of the cecum should be avoided as far as possible and unless the appendix is obviously in a dangerous condition it should not be removed if amebiasis is found; emetine should be given at once after operation.

However suggestive of acute appendicitis operation should not be advised in any case with an inflammatory mass until cecal amebiasis has been excluded. Amebic appendicitis is regarded for purpose of diagnosis and treatment as an extension of cecal amebiasis—unless complicated by abscess or perforation it is a medical disease.

Unruptured intestinal amebiasis and postdiverticular conditions of nonappendicular

origin often give rise to symptoms very suggestive of chronic appendicitis. Before appendectomy is advised these conditions must be carefully excluded. Operations occasionally required for residual appendicular disease following cecal amebiasis.

Examples of localized chronic amebic colitis and ulceration of the rectum which may be mistaken for carcinoma or other surgical disease are common in endemic areas. Minor anorectal conditions such as piles, fissure and fistula may result from unsuspected mild or chronic amebiasis.

With few exceptions abdominal or rectal operations are strongly contraindicated in patients suffering from intestinal amebiasis—they are often followed by serious complications peculiar to this disease. If operation is necessary, or if amebiasis is discovered at exploratory operation, the sooner emetine is commenced the better. Appendicostomy and cecostomy have no place in the treatment of this condition.

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THE SURGICAL TREATMENT OF INJURIES OF THE BRAIN SPINAL CORD AND PERIPHERAL NERVES

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CRANIOCEPHEAL INJURIES

THE recognition of craniocerebral injuries presents no problem. Evaluation of the extent of the damage, however, is often difficult or impossible during the first few hours after the injury. In closed head injuries intracranial hemorrhage is potentially present in every case. In compound head injuries correct appraisal is usually impossible before x-ray pictures of the skull have been taken. The clinical course observed for a period of time or surgical exploration carried out. Small lacerations of the scalp may be associated with extensive fissure fractures, comminuted or depressed fractures of the skull or with serious intracranial bleeding. This is especially true in the case of penetrating wounds which have been inflicted by small missiles.

IMMEDIATE TREATMENT

The earliest possible removal of patients with craniocerebral injuries to a hospital where intracranial bleeding can be controlled and definitive intracranial surgery as needed can be performed is the basic principle in the immediate treatment of these injuries. Emergency treatment has for its sole purpose the preparation of the injured man for this evacuation. Specific methods of treatment for cerebral concussion and edema are all of questionable therapeutic worth and need not be undertaken. If there are scalp wounds the hair should be cut for several inches about them with clippers or scissors but a razor should not be used at this time. Bleeding from open wounds of the scalp can usually be controlled by firm pressure dressings. Ligature of the larger arteries of the scalp is unsatisfactory and often impossible due to retraction of these vessels into the scalp. Troublesome bleeding from this source is best controlled by mattress sutures about bleeding vessels. Wounds should not be explored, irrigated, debrided or sur-

tured. Sulfanilamide powder¹ should be dusted into all wounds in 5 gram quantities. Dressings of gauze should be large enough to cover the wound generously and should be firmly applied with a bandage which covers the entire head. As long as it remains in place it should not be changed until the patient reaches the hospital where definitive treatment is to be given.

Blood lost through external hemorrhage from the scalp if great should be replaced exactly as it is in wounds of other parts of the body. Bleeding from the ears should be treated simply by covering the external ear with a large loose gauze dressing. No effort should be made to stop this bleeding. The auditory canal should not be explored mechanically, cleaned or irrigated. Neither cotton nor gauze should be introduced into the canal.

Shock is rarely the result of craniocerebral injury. Its presence usually indicates bleeding or trauma in other parts of the body. In these cases the head should not be placed lower than the trunk and the extremities since this position will aggravate intracranial bleeding. Otherwise shock associated with craniocerebral injuries should be treated without regard to the brain injury. Blood and plasma should be given as needed until the blood pressure levels approximate normal.

The unconscious patient should not be transported lying upon his back. In this position he may aspirate mucus and vomitus into his lungs and may have his airway obstructed by the tongue. He should be horizontal lying on his side, his body rotated well forward, his upper thigh flexed on the pelvis to hold him, his head resting on a firm pillow or folded blanket and turned toward the ground. This position will prevent the tongue

¹There are reports that nature has said to him when asked applied directly to the brain produce convulsions, but I practice large patients by the method in 3 days last campaign has no confirmed these observations.

from falling back and interfering with respiratory exchange. It will also prevent aspiration of mucus and vomitus and will greatly reduce the hazard of aspiration pneumonia. In compound wounds the patient as a rule should lie only upon the uninjured side of the head. Conscious patients may have the head and shoulders elevated.

Morphine and other opium derivatives are contraindicated in cases of severe craniocerebral injury because of their strong depressant action on the respiratory center of the brain. The soporifics such as chloral hydrate, paraldehyde, and amylal are contraindicated because their use masks the significant changes in the patient's state of consciousness which are of prime importance in determining the presence of intracranial bleeding and the indications for operation. Fortunately pain is rarely a serious problem in craniocerebral injuries, closed or open, unless they are complicated by serious injuries to other parts of the body. When wounds of the thorax, abdomen, or extremities do cause great pain the first considerations should always be to relieve the pain but to use the smallest amount of morphine which will effectively accomplish this.

Restlessness prevents serious problems in the care of craniocerebral injuries especially during transportation, and if violent may result in serious harm to the patient. Sodium luminal, 3 to 5 grains (0.2 to 0.3 gm.) given hypodermically is the best drug to allay restlessness in that it will quiet the patient without depressing the respiratory center or greatly disturbing his state of consciousness. Sodium bromide or the triple bromides, 15 to 30 grains (1 to 2 gm.) by mouth or 45 to 60 grains (3 to 4 gm.) per rectum are also of value. If neither of these drugs is available, morphine may be given in small doses, $\frac{1}{8}$ to $\frac{1}{16}$ grain (0.005 to 0.010 gm.) and repeated after 30 minutes if necessary, provided the respiratory rate remains above 16 per minute.

One thousand to 1500 cubic centimeters of fluid each 24 hours should be given to all patients and if the patient is unconscious or is vomiting this should be given either by means of the rectal drip or by slow intravenous administration.

The first doctor to treat the patient with a serious craniocerebral injury should record the following facts without fail: (1) time of injury as nearly as can be determined; (2) state of consciousness—is the patient rational, or is he less confused, drowsy, stuporous, or comatose; (3) paralysis—does the patient move both arms and both legs voluntarily or in response to painful stimuli; (4) aphasia—does the patient talk or is he conscious but unable to talk; (5) pulse rate counted for half a minute; (6) respiratory rate counted for a full minute; (7) blood pressure.

Transportation to a hospital where definitive neurosurgical care can be given the patient should be initiated as early as possible. With sulfonamide therapy, a primary closure of craniocerebral wounds can be carried out safely as late as 48 to 72 hours after injury. Air transport below 3000 feet altitude is perfectly safe. These patients tolerate transportation very well, particularly before a definitive operation has been performed. It is more important that definitive care be given by a well qualified and experienced neurological surgeon under favorable conditions than that it be given early.

Under conditions of warfare it is usually best even though this procedure requires 24 to 48 hours of travel to evacuate craniocerebral injuries directly to an evacuation or general hospital located at a safe distance from the combat area where there are highly trained surgical and nursing personnel, where x-ray and operating room facilities are superior and where patients can be held 7 to 10 days after operation before they are again moved.

DEFINITIVE TREATMENT

The term "concussion of the brain" here used in a broad sense to designate the entire complex of all defined and incompletely understood pathological processes other than gross hemorrhage which contribute to or are associated with disturbances of consciousness following cranial trauma, including so-called axonal disruption, edema of the brain and cerebrospinal fluid, hydrocephalus. The pathological and clinical manifestations of concussion appear immediately after injury and almost always become maximum within the first few

hours. Patients who make a satisfactory adjustment during this initial period usually survive.

Generally accepted and well authenticated specific treatment for cerebral concussion does not exist. Surgical decompression is ineffective and often harmful and should not be performed. Lumbar puncture for therapeutic purposes is of questionable value but the cautious removal of 1 to 2 cubic centimeters of spinal fluid for diagnostic purposes is permissible. Intravenous hypertonic glucose or sucrose solution (100 cubic centimeters of 50 per cent glucose or 200 cubic centimeters of 50 per cent sucrose) has only a temporary effect and some undesirable side effects. Frequently repeated administration is contraindicated because of possible renal damage. Magnesium sulfate (25 per cent solution 150 to 200 cubic centimeters) given by rectum is an effective means of combating concussion in many instances but it is an expensive procedure both in linen and labor and its general use is not encouraged.

Supportive treatment is very important. If this is adequate the great majority of patients suffering from posttraumatic cerebral concussion uncomplicated by gross hemorrhage will survive. Fluids must be given to meet the basic metabolic requirements in all patients with craniocerebral injuries. One thousand cubic centimeters per day may be regarded as the absolute minimum and 1500 cubic centimeters per day as the desirable average. During hot weather or periods of hyperpyrexia the amounts should be increased to 2500 to 3000 cubic centimeters. Fluids should never be put into the mouth of unconscious or stuporous patients but should be introduced by rectal instillations, hypodermoclysis or very slowly into a vein. Not more than 1000 cubic centimeters of the fluids given intravenously during a single 4 hour period should be in the form of physiological saline solution. When intravenous fluids are given in excess of this amount they should consist of 5 per cent glucose in distilled water.

Nutrition must be sustained. During the first 48 to 72 hours after the injury, however, the patient will need to be given only fluids (1500 to 2000 cubic centimeters) and glucose

(80 to 100 grams). After 72 hours the patient will need in addition to fluids and glucose 60 to 80 grams of protein daily and sufficient fats to make up his caloric requirements. The fat requirement may be obtained temporarily in whole or in part from the fats of the patient's own body but the proteins must be supplied to the patient most conveniently in the form of egg albumin given by the stomach tube. In the unconscious or the stuporous patient feedings must be given by the stomach tube because attempts to feed this type of patient by placing food in the mouth are frequently followed by a piration and pneumonia.

The prevention of aspiration pneumonia in the unconscious patient depends largely upon his position in bed. He should be placed on a firm flat bed preferably a fracture bed and supplied with a hard pillow. He should never lie on his back but rather on his side with the upper leg flexed the body rotated well forward the face down and the jaw and tongue dependent. In this position all mucus from the uppermost lung and bronchus the trachea the pharynx and the mouth will drain freely out and the tongue will not interfere with the airway. Unconscious patients should be turned from one side to the other every 4 hours at least and preferably oftener day and night.

The prevention of pressure sores of the skin and subcutaneous tissue will also be greatly aided by turning the patient frequently. In each position bony prominences must be protected from direct pressure of the bed or from other extremities. Tissues which have borne the weight of the body should be gently massaged with a well greased hand after each turning to restore the circulation more fully. The patient should be placed on an air mattress whenever one is available.

Intracranial Hemorrhage. Intracranial hemorrhage as a complication of closed craniocerebral injuries should be suspected in every patient who continues to get progressively worse following a blow to the head. It may be epidural, subdural, intracortical or intracerebral in location.

Epidural hemorrhage should be suspected with fractures of the vault. The bleeding is

arterial from torn branches of the middle meningeal artery, and hence is apt to be rapid. This requires early recognition and treatment. A negative exploration is better than one too late. Neurological signs may be generalized contralateral or ipsilateral. Hence bilateral exploration is usually indicated. The site of election for exploratory trephination is just above the middle of the zygoma exposing the main trunk of the middle meningeal artery. If the artery is torn close to the foramen spinosum it may be necessary to plug that foramen with bone wax and the surgeon should be prepared to do this. Considerable blood may be lost before the bleeding point is controlled; hence a donor should be present if possible. Small exploratory incisions may be made in the dura mater but it should not be opened widely at this time because rupture of the edematous cortex may result. Drainage down to the dura mater for a period of 4 hours may be useful.

Subdural hemorrhage is usually venous and occurs from torn cortical or subcortical veins. It rarely is under sufficient pressure to cause death and it usually stops spontaneously. Hence early evacuation is not so necessary as it is with epidural (arterial) bleeding; it may often be delayed profitably until cerebral edema has subsided. Since the site of bleeding in young adults is usually the anterior pole of the temporal lobe, exploration of the floor of the middle fossa is indicated and this is best exposed through a small osteoplastic flap after the period of acute edema of the brain has subsided, that is 5 to 10 days after injury.

A chronic subdural hematoma should be suspected in every patient with a head injury when satisfactory initial progress becomes arrested or whose condition actually deteriorates. These clinical changes may manifest themselves 2 to 6 weeks after the injury, occasionally later. The symptoms and signs are usually vague and often fluctuate from day to day or hour to hour. Under such circumstances bilateral exploratory trephination should be performed and the liquefied clot evacuated. Occasionally an osteoplastic flap is necessary if the clot has organized.

Intracortical hemorrhage if arterial is apt

to dissect into the ventricles and be rapidly fatal. If venous it tends to form large subcortical clots and then to stop spontaneously. These occur in the temporal lobes in 90 per cent of the cases, equally on the right and left sides and almost as often *contre coup* as on the side of the blow. These venous clots are rarely fatal. They are characterized clinically by preponderance of the focal signs over those of general intracranial pressure, the exact reverse of the clinical picture produced by surface clots. They are frequently associated with a subdural clot of moderate size. The presence of subcortical clots may be determined by pneumoventriculography or at operation by means of exploratory puncture or incision into the temporal lobe. Prognosis for the recovery of function after evacuation is favorable even after many weeks have elapsed.

Intracisternal hemorrhage is frequently associated with fractures at the base of the skull. Bleeding is usually from a tear in one of the large communicating veins leading from the cortex into a dural sinus and takes place directly into one of the subarachnoid cisternae. Since this is venous bleeding it is not under great pressure. However fatal results from this type of bleeding are frequent and are due to the fact that the large number of red blood corpuscles in the spinal fluid tend to block the channels over the cerebral hemispheres from which the cerebrospinal fluid is absorbed. The result is an acute hydrocephalus similar in character to the so called communicating type seen after meningitis in which postinflammatory adhesions of the subarachnoid spaces similarly interfere with the normal absorption of spinal fluid. Pre-sure signs usually do not appear critical until 1 to 24 hours after injury. Bleeding from the sinuses may be lessened by elevating the patient's head and shoulders. Spinal puncture is ineffectual in recovering the offending blood corpuscles at the point of actual obstruction over the surface of the cerebral hemisphere and possibly encourages fresh bleeding by temporarily lowering the pressure applied against the bleeding point. There is no accepted surgical measure to be taken against this type of intracranial bleeding and the prognosis has been

considered largely inherent in the injury itself. It may be that temporary drainage of one or both lateral ventricles by means of small catheters introduced through trephine openings may prove of value. General supportive measures similar to those outlined under the treatment for cerebral concussion are indicated.

Physical and mental rehabilitation of patients who have received a craniocerebral injury requires good judgment and skill. The patient must be encouraged in every way to think that the injury has been only a slight one. Terms like "concussion of the brain" and "compound fractures of the skull" must be absolutely forbidden and in the presence of the patient such simple terms as "bump on the head" and "cut on the head" substituted. Lumbar punctures in conscious patients are usually unnecessary and are particularly to be avoided. They add little useful knowledge, have little therapeutic value and leave a deep and bad psychological scar. An arbitrary period of bed rest for 2 to 3 weeks as was formerly practiced is no longer approved. Instead as soon as the patient feels able to sit up or go to the lavatory or to have his meals he should be allowed to do so. He should be encouraged to participate in the care of his room and his own person. Physical therapy including passive motion, baking, massage and electrical stimulation should be directed to paralyzed limbs.

Wounds of the scalp. Every wound of the scalp no matter how small may be a penetrating wound of the skull with injury to the brain. Therefore x-ray pictures of the skull should be taken in every case of craniocerebral injury before definitive treatment is begun to establish the presence or absence of concealed fractures, driven fragments of bone or retained missiles.

Primary closure of wounds should be attempted in every possible case. Each wound of the scalp may be needed later as a portal of entry into the intracranial cavity in search of intracranial bleeding. Primary closure may be properly attempted as late as 48 hours following the injury in wounds which have not received any emergency treatment with the sulfonamides provided careful débridement

is carried out and vigorous systemic sulfonamide therapy is instituted after the operation. Wounds which have received preliminary treatment with the sulfonamides may be closed as late as 72 hours or even 96 hours after the injury. Standard neurosurgical procedures should be followed with conservative débridement and meticulous approximation of the skin edges. Sulfanilamide powder may be lightly dusted into the wounds before closure. There is however a general and growing conviction that with adequate systemic chemotherapy the local administration of sulfanilamide powder is unnecessary and even undesirable.

Drainage should be employed rarely with wounds of the scalp and only for the purpose of relieving tension by evacuating fresh blood. Drains do not prevent infection; they frequently introduce it. When drains are used in noninfected wounds of the scalp they should be led out through stab wounds and should be removed not later than 24 hours after the operation.

Fractures of the skull. Simple linear fractures of the skull are of little consequence in themselves apart from the concomitant injury to the intracranial contents. They are however frequently associated with intracranial hemorrhage, those of the vault with epidural bleeding from a torn meningeal artery and those at the base with bleeding into the basilar cisternae from large veins or venous sinuses.

Compound linear fractures are important because they afford a portal of entry for infections into the intracranial cavity. This is especially true of fractures compounded through the cribriform plate, the accessory air sinuses or through the external auditory canal. Hence it is important to institute early and vigorous chemotherapy in all such cases. Bleeding from the ear indicates a compound fracture into the external auditory canal. Gross clots plugging the peripheral portion of the canal may be removed gently but no attempt should be made to explore the canal, clean it or even irrigate it. No cotton or gauze should be placed in the canal. The external ear should be covered with a flat sterile gauze dressing.

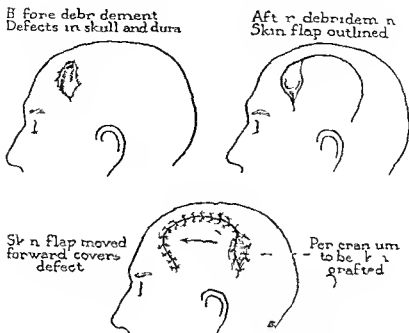


Fig 1 Method of loss of scalp by sliding flap method

Simple comminuted (depressed) fractures should be elevated early to avoid the effects of both general and local pressure upon the brain. Compound comminuted (depressed) fractures are frequently accompanied by perforation of the dura mater and laceration of the brain. X-ray studies are mandatory before definitive care is instituted. In treating these cases scalp, skull and dura should be debrided carefully, foreign matter should be picked out, devitalized brain removed with the sucker, hemorrhage arrested, the dura mater repaired and the scalp closed. Drains should as a rule not be necessary but if used they should be brought out through separate stab wounds and removed altogether during the first 24 hours. In cases in which sulfonamides have not been administered at all prior to operation, primary closure may be attempted at any time during the first 36 hours after the injury, provided that maximum systemic sulfonamide therapy be carried out postoperatively. In those cases in which sulfanilamide powder has been introduced into the wound as part of emergency treatment soon after the injury, primary closure may properly be undertaken as late as 7 hours after

the receipt of the injury in the majority of instances.

Closure of the dura mater and scalp is to be sought in all cases. Large dural defects should be closed by split dural flaps or with free transplants from the temporal fascia, the pericranium or the fascia lata. Penicillin (10,000 units) if available should be introduced inside the dura upon the underlying and adjacent brain.

The closure of wound of the scalp can be accomplished in most instances after extensive mobilization of the scalp between the galea and pericranium. If however this does not suffice then the best way to close a defect in the scalp usually is by means of a sliding flap of scalp having the shape of an elongated horseshoe (Fig 1). The flap should not include the pericranium. In outlining and cutting such a flap it is important to make it considerably oversized in both transverse and longitudinal directions because of the complete inelasticity of the tissue. If great care is not exercised in doing this the edges intended to be apposed will not meet. The base of the flap should be wide to insure adequate blood supply to its periphery. Edges of the flap not

suture 1 to the scalp should be loosely sutured to the pericranium. Drains usually need not and should not be used. The pericranial surface left exposed after moving the flap should be covered immediately by a Thiersch graft or a skin graft of intermediate thickness. Such grafts are successful in a very high percentage of cases. In the rare cases in which they do not succeed the exposed bone will be covered quickly with granulations if numerous small drill holes are made through the outer table to the diploic spaces. These granulations can subsequently be covered with pinch grafts or other types of skin grafts. Sulfanilamide powder should not be used locally but vigorous systemic sulfonamide therapy instituted.

Compound comminuted fractures into the accessory nasal sinuses present troublesome problems. No rule can be laid down for treatment which will meet the specific needs of every case. In general however the principle should be to repair the scalp and dura mater exactly as in compound comminuted fractures in other parts of the cranial vault and to do as little as possible to the sinus. In dealing with the sinus it is almost axiomatic that the less the surgery the less the trouble. The contour of the sinus should be re-established as far as possible by gentle manipulation with the smooth rounded end of a hemostat or any other similar instrument. Comminuted portions of the bony walls should be preserved wherever possible and only fragments of bone entirely detached from all soft tissues should be discarded. The mucous membrane lining the sinus should be carefully conserved even though badly torn because of the great power of regeneration possessed by this membrane and its strong tendency to re-form a functioning air sinus. The frontal sinuses should not as a rule be touched. Drains should not be used. The danger of serious intracranial infection is generally less than might reasonably be expected if sulfonamide therapy be aggressively employed. The administration of sulfanilamide powder locally in small amounts is recommended in these cases in addition to the systemic administration of the sulfonamides.

Repair of defects of the frontal bone resulting from compound comminuted fractures in

this region either with tantalum or by bone grafts should not be attempted at the time the acute injury is treated.

Rhinorrhea of cerebrospinal fluid persisting for longer than 5 days should be treated by intracranial closure of the internal orifice of the fistula by fascia transplant as soon as a craniotomy may safely be performed. Sulfadiazine should be administered systemically. Maximum chemotherapy should be instituted early and maintained for 10 to 14 days after operation.

Penetrating wounds of the brain. The basic principles outlined for the treatment of wounds of the scalp, compound fractures of the skull, cerebral edema and intracranial hemorrhage apply equally to the treatment of penetrating wounds of the brain. Hemorrhage and shock should be treated according to established principles. Roentgenograms of the skull should be studied before definitive treatment is undertaken.

Penetrating wounds when received for definitive treatment may be either fresh or old. The fresh cases include those not having received preliminary local or systemic treatment with sulfonamides but which present themselves for definitive treatment not later than 36 hours after the wound was received and without signs of active sepsis in the wound at that time also cases which have received adequate emergency sulfonamide therapy at the time of injury or soon after presenting for definitive treatment not later than 7 hours after the injury was received without signs of active sepsis in the wound at that time.

Early penetrating wounds of the brain should have definitive surgery at the earliest possible moment. The entire head should be shaved immediately before operation. A large area of scalp should be cleansed and so draped that any plastic procedure which might be necessary to close the wound such as a large sliding skin flap may be performed. Debridement of the skin should be conservative. All loose fragments of bone should be discarded. The openings in the skull and dura mater should be enlarged. Devitalized cortex should be excised. The tracts of all large missiles within the brain then should be thoroughly

explored. Dirt hair particles of clothing fragments of bone old blood clots and devitalized brain must be cleaned out after which the tract should be thoroughly irrigated with physiological saline solution. Damaged and contaminated brain lining these tracts may be removed with a blunt curette or a sucker. Penicillin (10 000 units) should then be introduced into the full length of the tract. The opening in the dura mater should be closed tightly by the use if necessary of free grafts of the patient's temporal fascia pericranium or fascia lata held in place with fine silk sutures. Primary suture of the skin must be accomplished over defects in bone and dura mater. If there has been loss of tissue of the scalp some standard form of plastic repair of the defect must be employed such as a sliding skin flap.

Penetrating wounds of the brain involving the frontal and ethmoid sinuses the anterior nares and the orbital fossae demand special consideration. Principles governing the care of compound comminuted fractures of this region already discussed naturally apply to these wounds. However in penetrating wound closure of the opening through the dura acquires maximum importance and is really the crux of the successful treatment of these cases. In order to close this dural defect it will usually be necessary to provide an opening through the frontal bone on the affected side large enough to expose the anterior pole of the frontal lobe and the floor of the frontal fossa. If the original opening in the skull made by the missile be high in the frontal region extending well above the supra-orbital ridge this original opening may simply be enlarged with rongeurs. If on the other hand the tract of the missile has involved only the bony structures of the floor of the anterior fossa and not the anterior wall then surgical exposure of the fossa should be through a small osteoplastic flap. The dura when exposed should be opened sufficiently to admit exploration of the anterior pole of the frontal lobe and the floor of the frontal fossa including the portal of entry of the missile. Bone dura and brain about this opening should be debrided and a careful toilette of the free space between brain and dura made. Un-

fortunately the direction of the tract of the missile is usually such that its exploration is impossible without making fresh deep incisions through the brain a measure which is rarely justifiable. A free graft of temporal fascia pericranium or fascia lata should be laid over the defect in the bone made by the missile. This graft should be large enough to allow generous overlap at all margins. Only rarely will it be possible to suture the graft in place effectively. However this is not necessary for if the graft be large enough and not too much brain tissue has been lost as a result of the injury or by débridement the weight of the released frontal lobe and its slight tendency to expand after the retraction will hold the graft securely in place until fibrous union between it dura and exposed bone takes place. The surgical incision made through the dura should then be closed with fine silk sutures. Penicillin (10 000 units in 2-3 c.c.) should be introduced into the subdural space. The local use of sulfanilamide in the region of the graft is undesirable since it will attract fluids which may loosen the graft. The galea and the scalp should be closed with interrupted fine silk sutures without drainage. Maximum doses of sulfadiazine and penicillin should be given systemically for 10 to 14 days after the operation. Great care should be taken to prevent upper respiratory tract complications during the postoperative course since violent sneezing or coughing might dislodge the graft.

The removal of bony fragments from the brain is of the utmost importance. Experience has shown that cerebral abscesses develop around 50 per cent of bone fragments not removed. The smaller metallic fragments constitute no such danger and attempts to remove them should not be made at the risk of damaging healthy cerebral tissue. It is desirable however to remove the larger missiles when this is surgically feasible.

Cerebral abscess should be suspected whenever normal recovery from a penetrating wound of the head is arrested. Pneumoencephalography may properly be performed under such circumstances. If an abscess be present it should be treated by any one of the standard methods.

Late penetrating wounds of the brain are those not included in the above categories. The majority will be septic. In addition to cellulitis of the scalp many will already have developed osteomyelitis cerebritis meningitis cerebral abscess or cerebral herniations and fungi. Treatment of these conditions will of necessity be determined by specific indications in the individual cases hence procedures will vary with each patient and for each complication. Cellulitis of the scalp should be treated with chemotherapy and in accordance with standard surgical principles. Osteomyelitis of the skull requires free dependent drainage of the bone and the adjacent covering soft tissues with removal of sequestra as they form in addition to intensive chemotherapy. Radical bone resection of large portions of the skull usually gives disappointing results and is not advocated. Preliminary studies with penicillin indicate that it may be particularly effective in the treatment of osteomyelitis. Sulfonamide therapy should be used actively. Meningitis and cerebritis can be treated only by the sulfonamides and penicillin but respond favorably in a majority of cases. Cerebral abscesses may be treated by whichever one of the commonly accepted methods the neurological surgeon prefers.

Abscesses secondary to penetrating wounds are usually due to retained bone fragments or other foreign matter along the tract of the missile. Exploration of the tract with removal of bone fragments and foreign material followed by a short period of drainage is the method of choice and offers a good prognosis for rapid healing.

Pathology and treatment of cerebral herniation. Cerebral herniation and fungus formation occur whenever there is a defect in the dura mater bone and lining of the brain and is due to the fact that no structure opposes the intracranial pressure which tends to push the brain out through the defect. Cerebral herniations invariably become infected and there is usually some necrosis of superficial tissue due to interference with the blood supply entering the herniation. A cerebral herniation which thus becomes infected and partially necrotic is designated as a cerebral fungus. If the intracranial pressure remains

normal the outward extrusion of the herniation or fungus as a rule gradually comes to rest the necrotic tissue is removed by natural processes and the surface of the brain becomes covered with granulation tissue and eventually scar tissue. This scar tissue in time contracts with sufficient force to counteract the expanding action of the intracranial pressure and will in favorable cases finally reduce the hernia completely to the general contour of the cranium. It then remains only for the surface of the scar tissue to become epithelialized which may take place spontaneously from the edges of normal skin or may have to be accomplished by grafting.

The primary object in the treatment of cerebral herniation is to keep to a minimum the protrusion of cortical tissue through the defect in the skull. In attempting to achieve this end effort should be directed primarily at minimizing expanding pressure within the skull rather than by attempting to hold the brain within the cranial cavity by applying pressure against it from without by means of pressure dressings. This latter procedure is almost always ineffective against continuous and elevated intracranial pressure and in addition causes pressure necrosis of the herniating brain and greatly increases the amount of local sepsis in the brain tissue.

Measures for reducing intracranial tension should include maintaining the patient in a sitting posture in bed whenever possible. Spinal drainage with removal of 30 to 50 cubic centimeters of spinal fluid should be performed twice daily for 4 weeks until necrotic and infected tissue has been removed from the surface of the herniation and the exposed brain is covered with a clean layer of granulation tissue. Great care must be exercised to keep the patient from acquiring upper respiratory infections which will force him to cough and thus violently force protrusion of a cerebral hernia. Also similar precautions must be taken against nausea and vomiting. The bowels must be kept open with the aid of laxatives since straining at stool and even the administration of enemas greatly increases intracranial pressure.

Local sepsis must be aggressively combated. Wet compresses Dakin's solution or sulfona-

mide dressings should be applied to the surface of the herniation or fungus until all necrotic tissue has been removed and exposed brain has been covered by healthy granulation tissue. Thereafter the granulating surface should be treated as any other granulating surface, the essential principle being the use of a lubricated dressing which will not interfere with the ingrowth of epithelium over the margins of the wound. Superficial marginal abscesses must be constantly looked for and effectively drained when present. These are apt to occur beneath the overhanging edges of scalp bone or dura mater. In the very beginning it is important to have the opening in the bone larger than the opening in the dura mater and the opening in the scalp larger than the opening in the bone in order to prevent abscess pocketing by overhanging tissue.

The herniation must be protected from direct pressure by a firm ring of cotton or gauze. Direct pressure will produce necrosis and an increase of local infection. As superficial tissue is lost through necrosis and sepsis, the lateral wall of the ventricle is approached and the danger of meningitis and rupture of the ventricle with leakage of spinal fluid becomes imminent.

Persistently progressive herniation after 3 to 4 weeks of proper treatment or excessively rapid herniation indicates pathologically elevated intracranial pressure. This is usually due to the presence of an intracranial abscess which may be extradural, subdural or intracerebral. X-ray evidence of retained bone fragments may reveal the site of the abscess. If the plain x-ray films offer no help, pneumo-ventriculography is indicated.

A new alternate method for the treatment of cerebral herniation has recently been advocated. This consists of forcibly reducing the herniation and holding it in place within the cranial cavity by means of a perforated tantalum plate which is securely fixed into the defect of the skull. The irritating effects produced by gauze or other types of restraining dressings are greatly minimized with such a tantalum dressing and the vicious pathological cycle resulting from progressive or continuous herniation is avoided. The outer surface of the tantalum plate is in turn covered

by a sliding flap of calp. The complications from infection which might reasonably be expected are reported to be infrequent. Despite obvious objections this procedure has much in principle to recommend it. It is too soon however to make a final appraisal of the method at this time although reports to date make further application in selected cases justifiable.

SPINAL INJURIES

IMMEDIATE TREATMENT

Injuries of the cervical spine resulting from indirect trauma are almost invariably forward dislocations of the head and upper part of the cervical spine upon the lower part with a pathological anterior angulation at the level of the lesion. In the production of the injury one or more of the articulating facets of the involved vertebrae may be chipped off but these small fractures must always be regarded as secondary to the dislocations. Determination of the exact level of the fracture-dislocation is unimportant for the emergency treatment.

The diagnosis of fracture-dislocation of the cervical spine should always be suspected whenever an injured man complains of severe pain in his neck. The diagnosis should be made definitely whenever an injured man is unable voluntarily to move either his arm or legs.

The most important principle in the emergency treatment of fracture-dislocations of the spine is to do nothing which will increase the bony deformity. Do not move the patient unless absolutely necessary for each new movement may cause bone to cut into the spinal cord. Do not raise the patient's head to give him a drink or a cigarette. Do not put a rolled blanket or pillow beneath the head. Do not lift the patient off the ground unless he is on a litter or other rigid support. Reduction should not be attempted. Plaster casts should not be applied.

The patient with a fracture-dislocation of the cervical spine is in the optimum position when he is lying on his back with a folded blanket 3 to 4 inches thick beneath his shoulders and his head below the level of his shoulders and his neck in slight dorsiflexion.

(hyperextension) Folded blankets should be secured at both sides of the head to prevent lateral movement. A patient with a fracture dislocation of the cervical spine should not lie face down with his neck twisted nor upon his side with his neck flexed laterally. Care should be taken that clothing and blankets are smooth beneath the patient. Pockets should be emptied.

Three persons are needed to turn properly a patient with a fracture dislocation of the neck onto his back from some less favorable position. The senior of the three men should grasp the chin and occiput and exert steady traction in the line of the long axis of the body. The second man should grasp the ankles and exert equal countertraction along the axis. The third man should then kneel beside the patient, reach across his body and grasp the patient's clothing near the shoulder and near the hip joint with his two hands. He should then gently rotate the patient toward himself while the men at the head and feet exert their traction. The head, neck, body and legs should all be made to move simultaneously. A folded blanket 3 to 4 inches thick should be so placed on the ground or the litter that the patient's shoulders finally come to rest on top of it when rotation has been completed. This position will allow the head to hang down slightly and permit a moderate dorsal flexion (hyperextension) of the cervical spine—a position which tends to correct the deformity caused by the fracture dislocation.

A patient with a fracture dislocation of the cervical spine should never be lifted from the ground on to the litter; he should be rotated or pulled on to it. In transferring a patient from the ground to the litter, the latter should be placed beside the patient. If he be lying face down upon the ground, he may be rotated on to the litter in the manner described in the preceding paragraph coming to rest on his back with the folded blanket beneath his shoulders. If the patient be lying face upward on the ground, the three men should take the same positions as for turning him, with the exception that the man at the side should grasp the patient's clothing on the side nearest to himself. The three men then gently slide the patient from the ground on to the litter

without lifting him; the two men at the head and feet meanwhile maintaining a strong longitudinal traction.

The prevention of pressure sores is a major problem in all paralyzed patients. Efforts should be made from the beginning to keep pressure off the sacrum and the heels. When ever possible the paralyzed patient should be placed upon an air or other soft mattress during transportation.

Urinary retention is common with spinal cord injuries. Extreme distention of the bladder must be avoided. An indwelling catheter should therefore be introduced before distention of the bladder occurs and especially before transportation of the patient to a distant point is initiated. The catheter must never be clamped. If cystitis should develop it will not become serious as long as drainage is free and it can be readily cleared up with the aid of tidal drainage and sulfonamide therapy at the hospital to which the patient is taken. Cystostomy should not be performed.

Morphine should not be given to patients who have received injuries to the cervical spinal column.

All patients with fracture-dislocation of the cervical spine should be transferred as early as possible to a hospital where definitive neurosurgical treatment can be given.

The common lesion of the lumbar spinal column is a compression fracture of the body of the first lumbar or adjacent vertebrae. This results in an anterior angulation of the spinal column which causes compression of the spinal cord. Dislocation between the vertebrae is uncommon at this level. The diagnosis should be suspected whenever an injured man complains of a severe pain in his lumbar spine and should be made definitely whenever such a man is unable voluntarily to move his legs.

The fundamental principles for the emergency treatment of compression fractures of the lumbar spine are essentially the same as for fractures of the cervical spine. The patient should not be moved unless it is absolutely necessary. He should not be picked up and carried from one place to another unless he has first been placed upon a litter or other rigid structure. There are two acceptable positions for a patient with a compression

fracture of the body of one of the lumbar vertebrae. If an air mattress is available the patient should be placed upon it lying upon his back with 2 or 3 folded blankets underneath the air mattress at the site of the fracture so placed as to produce hyperextension of the spine. If an air mattress is not available then the best position for transport is the face down position. This position automatically prevents further anterior flexion of the lumbar spine. It also prevents the formation of pressure sores at the point of angulation of the spine and over the sacrum. However in this position the toes, knees and genitals must be protected against pressure. No other attempt at correction of the bony deformity should be made at this time. Plaster casts should not be applied to any patient with a spinal cord injury having anesthetic skin.

The principles involved in turning a patient with a compression fracture of the lumbar spine are similar to those for turning a patient with a fractured cervical spine except that in fractures of the lumbar spine traction by the man at the head of the patient may be applied under the armpits. In transferring the patient from the ground to the stretcher the same principles apply as in the case of a patient who has a fracture dislocation of the neck.

The principles which underlie the prevention of pressure sores and the care of the bladder in patients with a compression fracture of the lumbar spine are the same as those which apply to the patient with a fracture dislocation of the cervical spine. Morphine may be given as necessary to control pain and the patient should be transported as early as possible to a hospital where definitive neurosurgical treatment can be given.

Compound injuries of the spinal column are usually the result of gunshot wound. No attempt at definitive treatment should be made at the site of the accident. Sulfanilamide powder should be dusted lightly into the wound. Large protective dressings should be securely applied. In all other respects the patient should be treated and transported in accordance with the principles outlined for the care of closed spinal injuries. Since penetrating wounds of the spine are frequently associated

with wounds of the lungs or abdominal viscera such complications should be looked for and treated appropriately.

DEFINITIVE TREATMENT

Quantitative relationship between injury to bone and injury to spinal cord does not exist. The differential diagnosis between anatomical severance of the cord and a simple and temporary physiological interruption of function is often difficult or impossible to make clinically during the early posttraumatic period. Hence the dictum that all cases of paralysis following spinal injury must be treated as though they were suffering from a recoverable lesion until proved otherwise.

The neurological signs present after spinal injury may be due to any one or a combination of the following pathological factors: (a) edema of the cord, (b) hemorrhage into the cord, (c) compression of the cord by displaced vertebrae and (d) anatomical section of the spinal cord.

Edema of the spinal cord occurs with every serious injury of the spine. It develops rapidly and is often extreme. Within an hour after injury the spinal cord may be two or three times the normal diameter so that it fills the dural envelope tightly. This is the most common cause of manometric block (positive Queckenstedt sign) during the first few days after injury. If the dura mater is opened at this time spontaneous rupture of the spinal cord with anatomical loss of continuity may result. A manometric block therefore should not be considered as an indication for laminectomy during the acute posttraumatic period. The clinical signs produced by severe edema of the cord are indistinguishable from those produced by transection of the cord during the first 4 to 48 hours after injury. They tend to improve after the 4th or 5th day and complete functional recovery from total paralysis may follow quickly.

Hemorrhage may occur into the extradural, subdural and subarachnoid spaces but in these sites it rarely causes compression of the cord or produces neurological signs of clinical significance. Hemorrhage into the cord itself is limited almost invariably to the central grey matter (hematomyelia). Here bleeding

may dissect its way up and down the grey matter for a number of segments. The clot thus formed never attains sufficient diameter to cause compression of the long tracts adjacent to it or to require decompressive measures. It produces its effects by disrupting neurones and reflex arcs at segmental levels producing motor effects of the lower motor neuron type i.e. flaccid paralysis muscle atrophy and hypotonic reflexes. After liquefaction and absorption of this clot some return of function may be expected in the affected reflex arcs. Surgical evacuation of these intraspinal blood clots produces irretrievable damage to segmental neurones and reflex arcs and this procedure therefore should not be performed.

Compression of the cord by displaced bone is a less frequent cause of persistent paralysis following spinal injury than is generally assumed to be true. This is because the bony neural canal is so much larger than the spinal cord that considerable encroachment upon the lumen of the canal may take place without serious pressure upon the cord. Notwithstanding this general anatomical fact however correction of bony malalignment and deformity following spinal injury is important and should be performed as soon as it can be properly done.

Typical skeletal deformities of the spine may follow either direct or indirect violence. Direct trauma to the spinal processes and laminae due to blows from the rear in which the laminae are fractured and driven into the bony canal is rare with the closed type of injury but common with gunshot wounds. When encountered immediate laminectomy with the removal of the offending bone is indicated. This is the only type of spinal injury which offers an absolute indication for an early laminectomy.

In direct trauma of the spine produces typical deformities. In the cervical spine there usually occurs a forward dislocation of the head and the upper portion of the cervical spine over the lower portion of the cervical spine. This may be unaccompanied by any fracture but it is usually accompanied by a fracture of one or more of the articulating facets of the affected vertebrae. It will

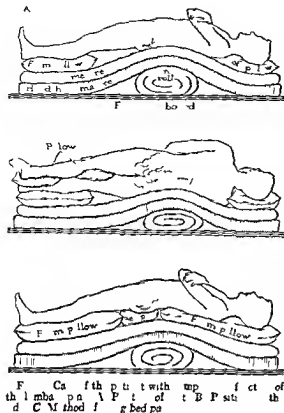
be borne in mind however that the essential lesion is usually that of a forward dislocation and that the fracture of the articulating processes is secondary. This typical injury is referred to as a fracture dislocation.

In the thoracic spine the plinting afforded by the thoracic cage is so great that fractures severe enough to produce neurological signs rarely occur unless the trauma has been of extreme violence as when for example a person falls from a great height or is thrown from a rapidly moving vehicle against a telegraph pole or tree. Under such circumstances ribs are usually broken destruction and malalignment of the spinal column are tremendous and the spinal cord is usually transected.

In the lumbar spine following sudden arrest of forward motion of the patient's body the strong articulations between the vertebrae hold fast but the bodies of the vertebrae give way. The resulting and typical lesion is a compression of the body of one or more of the lumbar vertebrae usually just below the thoracic cage. Dislocation between the vertebrae either forward or lateral is rare and acute forward angulation is the main deformity.

The treatment of bony deformities depends upon the nature and site of the injury. Depressed fractures of the laminae require immediate laminectomy and the elevation of depressed bone.

Fracture dislocation of the cervical spine is best corrected by closed traction methods. Laminectomy with open operative reduction is usually not only unnecessary but is strongly contraindicated and should not be employed. The best method of reduction is by skeletal traction applied with the skull tongs described by Crutchfield. Halter traction with straps applied around the occiput and beneath the chin is unsatisfactory because it is extremely uncomfortable it interferes with movements of the jaw in eating and talking and it tends to produce pressure sores beneath the chin and at the occiput. Furthermore considerably less traction may be applied by this method. The former practice of rapid reduction using traction of great force with the immediate application of a plaster cast extending over the occiput and chin down over the thorax is no longer justifiable with the



Compression fractures of the lumbar vertebrae do not require surgical procedures. Laminectomy is strongly contraindicated in most cases. These deformities are best corrected by closed methods of hyperextension. Fracture boards are first placed upon the bed to prevent sagging. Two or three blankets are then made into a roll the width of the bed and approximately 18 inches in diameter. This is placed across the bed on the fracture boards at the level of the spinal injury. A hard hair mattress is placed over the blanket roll and on top of this a softer mattress, preferably an air mattress, if one is obtainable. The curved surface of the uppermost mattress will then conform approximately to the normal lumbar curvature of the healthy spine. When the fracture bed has thus been set up the patient is gently lifted on to it face up in such a position that the site of the injury lies above the blanket roll. The weight of the upper and lower parts of the body will then serve slowly to bring the kyphosed spine into a position of normal lumbar lordosis. This method of reduction is far more efficient and less traumatizing mentally and physically to the patient than is the older method of reduction by suspension upon a canvas hammock (Fig. 2a).

newer methods now available. Frequent x-ray examination should be used to control the reduction of the fracture dislocation at all stages both early and late. Traction should be maintained until sufficient time has elapsed for firm fibrous union to be established between the injured vertebrae and this usually requires at least 6 weeks in severe injuries 12 weeks. Weight bearing should be deferred until repair of bone is well under way; patients therefore should remain in bed in a prone position for approximately 12 weeks after removal of traction. When the patient finally becomes ambulatory he should wear a plaster or a leather collar for 6 months or more.

Fractures of the thoracic spine with the usual gross misalignment of the vertebrae can not be satisfactorily corrected by any method open or closed. The spinal cord has usually been transected at the time of injury and prognosis for the recovery of spinal puncture is hopeless. Laminectomy is usually futile and hence contraindicated.

The bed care of patients with fractured spine is of prime importance. In order to change bed linen or to bathe these patients they may be turned on their side without risk of injury if the bed has been properly set up. The soft tissue between the hip, the pelvis and the lower edge of the thorax will conform very satisfactorily to the curvature of the bed as the patient is turned without permitting significant lateral misalignment of the spinal column. Moreover the large intervertebral articulations at the level of the lesion are rarely damaged sufficiently to allow lateral misalignment (Fig. 2b).

In using the bed pan the patient is rotated gently to one side. The bed pan is then placed in the center of the bed and firm pillows or folded blankets having the same thickness as the bed pan itself are placed on the bed above and below it. If these pillows or blankets have the correct thickness and firmness and are properly placed the original curvature of the top mattress is preserved (Fig. 2c).

The patient is then slowly rotated on to his back so that his back and legs are supported at exactly the same level as the bed pan. In this way hyperextension of the spine is maintained. A bed pan should never be placed beneath a patient with a compression fracture of the lumbar vertebrae unless these precautions against intlexion are first taken. Another method of evacuating the bowels of a patient with a fractured spine is to place him upon one side and carry out colonic irrigation.

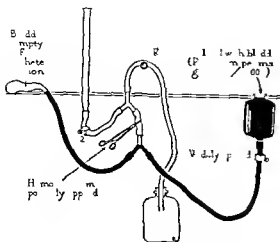
Prevention of hypostatic pneumonia is a major problem during the first days of treatment in all fractures of the spine. In fracture dislocation of the cervical spine specific injury often occurs to the 4th and 5th cervical segments from which the phrenic nerves innervating the diaphragm take origin. In addition to this the attendant edema of the cord tends to interfere with the passage of impulses from the respiratory center of the brain to the respiratory musculature of the thorax. For these two reasons respiratory movements are apt to be hallow. Coupled with this is the fact that the patient is lying on his back in which position it is difficult for him to clear his mouth and posterior pharynx of accumulated mucus. Should signs of impending pneumonia appear it is imperative that treatment of the pneumonia take precedence over treatment of the fracture for the reason that an accurate alignment of spine is of no value if the patient dies of pneumonia. Accordingly any patient threatened with or suffering from pneumonia must be turned from one side to the other every 2 to 3 hours day and night to permit free drainage of exudate and mucus from first one half and then the other half of the respiratory tree. All other supportive measures generally employed in the treatment of pneumonia should of course be utilized.

In compression fractures of the lumbar spine pneumonia is caused by a different mechanism. The continued hyperextension of the body causes the rectus muscles of the abdomen to pull upon the lower ribs. An acute traumatic peritonitis frequently develops at the point of attachment of the rectus muscles. This may be quite painful and cause involuntary splinting of the lower part of the thoracic cage. This limitation of respiratory

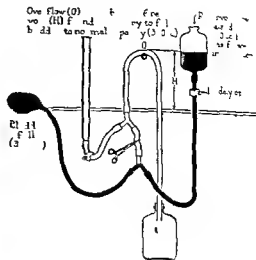
movements in the lower lobes of the lungs predisposes to the development of hypostatic pneumonia in much the same way that splinting of muscles after upper abdominal operations does. These patients must be given sufficient morphine during the first few days that they are lying in hyperextension to mask the pain due to the mechanism just described. If this be done promptly and adequately respiratory movements will be inhibited only slightly and the tendency to hypostatic pneumonia greatly reduced. Should pneumonia develop the same general principles regarding its treatment apply in the lumbar fracture as in the cervical fracture.

Abdominal distention may occur during the first few days after an injury of the lower thoracic spine due to interference with the autonomic nervous system. It should be dealt with vigorously along the same lines used in treating paralytic ileus following abdominal operations. Passage of a Miller Abbott tube into the upper alimentary tract is the best method. Eutressin (1 c.c. ampul) or prostigmine (1 c.c. ampul) may be given intramuscularly. Rectal tubes should be used. Enemas of soap suds or water and glycerine may be tried. Hot stupes to the abdominal wall are often effective. As a rule distention is rarely critical and is usually short lived.

All so called bed sores are pressure sores and are invariably the result of local ischemia caused by continued pressure upon soft tissues. It is no longer permissible to regard pressure sores as trophic disturbances. Prevention is the best treatment. This demands constant vigilance to prevent continuing pressure by a hard bed or by other parts of the body upon soft tissues overlying bony prominences. Wherever possible a paralyzed patient should be placed upon an air mattress. As a rule the patient may lie on his back on such a mattress indefinitely without developing pressure sores of the skin over the sacrum. Even with an air mattress however it is necessary to keep the heels off the mattress by placing a firm pillow or a folded blanket of sufficient thickness crosswise beneath the calves of the legs so that the heels do not touch the bed. Small pillows or cotton pads must also be placed between the knees and between



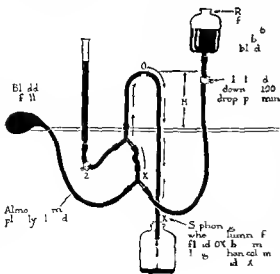
F 3



F 4

the ankles and to s. Finally the bed covers must be kept off the toes by means of a frame.

If an air mattress be not available prevention of pressure sores is very much more difficult. Under these circumstances air rings when available should be used to protect bony prominences. If these be not available the surgeon must rely upon frequent turning of the patient and the use of cotton pads at vulnerable points to prevent the development of pressure sores.



F 5

The treatment of existing pressure sores should follow the same basic surgical principles applying to the treatment of other wounds containing infected and necrotic tissue. All devitalized skin, fat and subcutaneous tissue must be excised immediately with scalpel or scissors. Wet saline compresses, Dakin's solution or moist sulfonamide dressings must be applied to the infected base until it is covered by healthy granulations. Skin grafts may be used to hasten healing.

Plaster casts should not be applied to the trunk and extremities of any patient with a spinal injury having anesthetic skin.

Care of the bladder is a major problem in every paralyzed patient. The purposes of treatment are twofold: (a) the prevention of serious sepsis of the urinary tract and (b) preservation of normal bladder capacity and musculature. The former is necessary for the preservation of life, but the latter is very important if the patient is to make a satisfactory social adjustment after his recovery from the acute phases of his injury. In an effort to attain the former objective the secondary objective should not be ignored.

Extreme distention of the bladder should be avoided at all times as a first principle. An indwelling catheter should therefore be introduced at the time emergency treatment is given before distention occurs and especially before the evacuation of the patient to distant

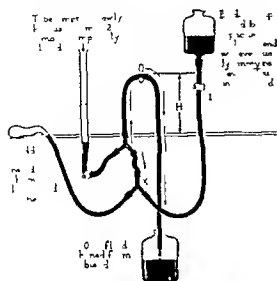


Fig 6

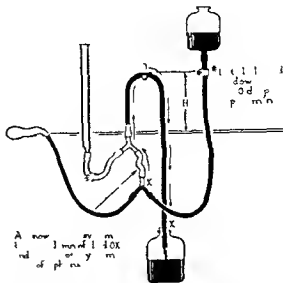


Fig 7

points is initiated. If cystitis develops it will not become serious provided drainage be free and the bladder mucous membrane has not been fissured or the muscular walls paralyzed by extreme distention. It can be readily cleared up with the aid of tidal drainage and sulfonamide therapy at the hospital to which the patient has been evacuated. The in lying catheter should be as large in caliber as the patient will readily tolerate.

Tidal drainage is considered the method of choice in the treatment of the paralyzed bladder and should be instituted as soon as the paralyzed patient is received in an established hospital. Should standard sets not be available at the time needed the neurosurgeon should improvise tidal drainage along accepted lines. There are several acceptable forms of tidal drainage, one is here shown for purposes of reference (Fig 3 to 8). It is important that the catheter and drainage tube should be brought out over the thigh rather than allowed to fall down between the thighs and lie along the bed. In this latter position an acute angulation of the urethra occurs at the level of the suspensory ligament which will contribute seriously toward the production of irritative urethritis. By bringing the tube laterally over the thigh this angulation with its resultant urethritis is prevented. The in lying catheter should be removed approximately

once a week. This should be done in the morning and a new catheter should not be replaced until late in the day. This allows 8 to 10 hours for voluntary micturition to occur if the bladder mechanism is ready to assume that function. If voluntary micturition does not occur the catheter should be replaced and tidal drainage continued for another week, when the procedure outlined above should be repeated.

Voluntary control of the bladder often does not return until 6 or 12 weeks after injury.

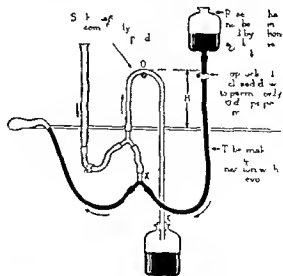


Fig 8

and tidal drainage should not be discontinued before that time without good and specific cause. Even in cases in which the spinal cord has been completely sectioned at the time of injury, an automatic type of bladder can usually be established after 8 to 12 weeks. After removal of the catheter in such a bladder there is no dribbling of urine and periodic voidings of 150 to 300 cubic centimeters of urine can be initiated voluntarily by abdominal straining or by sustained pressure applied manually to the abdominal wall over the bladder area by patient or attendant at periodic intervals.

Cystotomy should not be employed when tidal drainage by urethral catheter is available unless that method has been fully tried and proved unsatisfactory. The only absolute medical indication for cystotomy is a fulminating urinary infection which has not responded satisfactorily to tidal drainage. A high cystotomy is preferable to a low one. This procedure should be performed by a urologist if he is available.

Compound injuries of the spine usually result from gunshot wounds and often are associated with penetrating wounds of the thorax or abdomen. Early laminectomy with full exposure of the cord is usually indicated but must be regarded as secondary to the treatment of the thoracic or abdominal wound. Splinters of bone and metal should be removed from the canal when their presence threatens damage to the cord. Sulfonamide powder should not be directly introduced into the spinal fluid or onto the cord although the small amounts which may get there from other parts of the wound will cause no damage. Disinfection of the cerebrospinal fluid should depend upon a high blood level of sulfadiazine and with this drug the cerebrospinal fluid level is about half that of the blood level. The dura should be closed if possible to prevent spinal fluid leak. A free transplant of fascia may be used to accomplish this if necessary. Sulfanilamide powder should be lightly sprinkled about the exposed bone and throughout the muscular and fascial layers. These tissues and the skin should be closed without drainage otherwise a spinal fluid leak with formation of a fistula and with terminal meningitis is apt to occur.

Recovery of function in extremities and sphincters after severe spinal injury may require weeks or even months. If meticulous care of the skin, bladder and limbs, including massage, passive motion of joints and corrective splinting be maintained, many seemingly hopeless cases will recover a great measure of useful function.

PERIPHERAL NERVE INJURIES

In simple lacerations of soft tissue made with sharp edged or pointed instruments peripheral nerves are often divided cleanly with minimal contusion of the nerve trunk on either side of the division and without loss of nerve tissue either immediate or late. In such cases the two ends of the divided nerve can be easily approximated without tension. Suture of the nerve in this type of injury may be performed at the same time that first surgical care is given to the flesh wound provided that the wound is fresh, suitable instruments are at hand, time is sufficient and other circumstances favorable.

Accepted surgical principles and technique should be employed in repair of both nerve and flesh wound. Interrupted sutures of fine silk or tantalum wire placed in the epineurium should be used for suture of the nerve. Primary closure of skin is mandatory if suture of the nerve has been performed. Drains are generally undesirable but if considered temporarily necessary on account of oozing they should never come in contact with the suture line of the nerve and should be removed during the first 4 hours after operation.

Sulfanilamide powder may be dusted lightly into the wound and about the suture line. This drug increases scar tissue reaction slightly in the soft tissues about the nerve but does not interfere with the regeneration of the nerve. Evidence is accumulating however to indicate that sulfadiazine given by mouth in sufficient quantity to maintain a high blood level of the drug afford as great or even greater protection against infection than does sulfanilamide powder placed directly in the wound without certain undesirable secondary effects caused by the latter procedure.

In the severe penetrating or crushing wounds commonly encountered in war in

which major nerves have been divided definitive suture of these nerves at the time of first surgical care while theoretically desirable is almost never feasible. The reasons are as follows. In the first place in badly contused nerves the full extent of the intrinsic hemorrhage and other damage to the bruised ends of nerves cannot be immediately appraised nor can the ultimate line of demarcation between viable and nonviable nerve be determined. Second if much of the nerve has been shot away reapproximation of the ends of the divided nerve will be possible only if the nerve is mobilized for considerable distance on both sides of the injury. To carry such dissection away from a grossly contaminated and potentially infected field proximally into clean tissues would entail serious and unnecessary risks. Third proper mobilization and suture of a badly damaged nerve might well require several hours of operating when neither the patient's condition nor the exigencies of the situation would justify the expenditure of so much time. And finally the surgical necessity of leaving most battle wounds of soft tissue unsutured for 5 to 10 days after initial débridement would almost certainly result in a breaking down of the line of sutures.

In practice battle wounds usually do not reach the surgeon until 12 to 48 hours after they have been incurred at which time the first concern is the prevention of sepsis in the soft tissues especially gas bacillus infection. This is dependent largely upon proper débridement of the wound. Débridement of the skin should be conservative but exploration of the wound should be very thorough. The tracts of missiles should in most instances be left open all foreign matter such as bits of clothing should be scrupulously sought out and removed and all muscle which appears deprived of its blood supply badly crushed or grossly contaminated should be excised. The free ends of divided nerves if these be seen should be drawn together when possible with several temporary sutures of fine catgut or tantalum wire placed in the epineurium to prevent retraction of the nerve ends pending final definitive suture at a later date. Silk sutures should not be used for this purpose as the silk will remain as infected foreign matter

The wound is not sutured but merely covered with a protective gauze dressing. It is best not to introduce sulfanilamide powder locally into the wound but a high sulfa level in the blood stream should be early established and maintained by the systemic administration of sulfadiazine.

Secondary closure of the wound may usually be performed 5 to 10 days after débridement. At the time this is done there should be a therapeutic sulfonamide level in the blood stream. The edges of the skin should again be freshened up and granulation tissue trimmed away. The skin should then be undrained and mobilized as much as necessary to effect approximation of its edges and sutured with simple or vertical mattress sutures. Moderate tension is well tolerated and is justified if necessary to effect closure. Drains are not needed and should not be used. Neither sulfanilamide or penicillin should be placed in the wound but a therapeutic level should be maintained in the blood until the wound has healed. Sutures may be removed as a rule after 7 to 10 days and the wound may be regarded as healed 2 to 3 weeks from the time of operation.

The final definitive suture of the nerve may be performed 2 or 3 weeks after the sutures have been removed. At this time proximal and distal segments of the nerves should be exposed and the ends of the nerves freed from surrounding cicatrix intrinsic scar tissue excised from the terminal ends of the nerve segments the nerve trunks mobilized as extensively as necessary to obtain approximation of the segments without tension and end-to-end suture performed. The fundamental requirement for all nerve suture is that it be done without tension. The actual suture should be made with interrupted sutures of fine silk thread or tantalum wire placed only in the epineurium. Following this the extremity should be immobilized with neighboring joints in positions of flexion for approximately 3 weeks. After this another 3 weeks should be allowed to get the extremity again extended.

Physical therapy should be instituted about the third week after suture. This should include daily massage to improve circulation

passive and active motion to keep joints, tendons and muscles supple and galvanic stimulation applied directly to individual denervated muscles to preserve the contractility of muscle element and to prevent the atrophy of disuse. The minimum effective galvanic stimulation consists of 30 contractions of each paralyzed muscle repeated three times daily three days each week. More frequent stimulation is of course desirable.

Splints should be used as needed to re-enforce weakened or paralyzed muscles and prevent contractures but these splints should be of such a type as to allow free voluntary and passive movements of all joints. If plaster-of-Paris splints are used they should be worn only at night and left off during the daytime and the patient encouraged to carry out maximum passive and active movements during his waking hours.

THIOURACIL—ITS USE IN THE PREOPERATIVE TREATMENT OF SEVERE HYPERTHYROIDISM

FRANK H LAHEY MD FACS ELMER C BARTELS MD SHIELDS WARREN MD
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ENITRILACL obtained from the clinical use of thiouracil over a period of 2 years permits certain conclusions regarding this potent biochemical agent. Thiouracil does reduce the elevated metabolic rate of hyperthyroidism to normal if it is administered over a sufficient length of time; in addition there is a gradual disappearance of all hyperthyroid manifestations except those of the eyes if these manifestations are very pronounced before treatment is begun. Conclusive proof has been definitely established that thiouracil possesses great therapeutic value in the preoperative management of severe hyperthyroidism. Consistent and permanent remission of hyperthyroidism by prolonged administration and then with drawal of thiouracil seems highly unlikely. Considerable time and further careful observations will be required to determine this possibility.

Further comparisons can now be made between the pathologic physiology of the hyperthyroid gland under iodine therapy and that following thiouracil administration. Observations have been made on the thyroid tissue removed at operation from patients receiving thiouracil alone and thiouracil in combination with iodine. An attempt will be made to evaluate the findings.

This report will be discussed under 3 headings: (1) clinical observations on severely hyperthyroid patients prepared for thyroidectomy with thiouracil; (2) comparison of the action of Lugol's solution with thiouracil on the hyperthyroid gland; and (3) pathologic observations on thyroid tissue removed at operation from patients treated with thiouracil only and thiouracil in combination with Lugol's solution.

CLINICAL OBSERVATIONS

Thiouracil has been used at the Lahey Clinic in the preoperative management of severely toxic hyperthyroid patients since May 1943. In dealing with the hyperthyroid patient surgically we were convinced early that thiouracil is of great advantage since it has the power to bring about a positive remission in patients who are dangerous risks or who are so toxic as possibly to require multiple stage procedures. In addition to eliminating two stage thyroidectomies entirely deaths which result from so called postoperative thyroid storm or reactions are avoided with certainty. Patients with mild hyperthyroidism continue to be prepared with iodine since in this group sufficient improvement occurs to permit thyroidectomy without risk and the dangers entailed with the use of thiouracil are thereby avoided.

One hundred ninety patients with severe hyperthyroidism have now been treated preoperatively with thiouracil and have gone through thyroidectomy. Both types of hyperthyroidism were represented in this group—primary hyperthyroidism or Graves disease and adenomatous goiter with hyperthyroidism. Response to thiouracil therapy was equally satisfactory in the two groups. When treatment was continued sufficiently long no patient failed to respond satisfactorily.

In the first 100 patients treated there were 83 females and 15 males. The age varied from 11 to 77 years; the average age was 45 years. Forty four patients were over 50 years of age. The average duration of the hyperthyroidism was 4 months. Almost half 43 patients had had hyperthyroidism for more than 5 years; of these 11 had been ill for more than 5 years. Twenty five of the 100 patients had lost more than 40 pounds; average weight loss being 25 pounds. The average basal metabolic rate was +40. 54 patients had initial rates over +4

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All of the patients were considered to have severe hyperthyroidism since most were in the older age group the disease was usually of long duration considerable weight loss had occurred and the basal metabolic rates were usually high. Thirty five of the 190 patients were classified as thyrocardiacs having either heart failure or auricular fibrillation without heart failure. This latter group of patients in our experience has in the past carried the highest mortality rates following thyroid surgery.

PLAN OF TREATMENT

For most patients treatment is ambulatory. Those with hyperthyroidism and associated heart failure or those extremely ill from hyperthyroidism alone are admitted to the hospital. In the former group combined cardiac and thiouracil treatment is begun and when cardiac compensation is restored after 10 to 14 days these patients are discharged to carry on treatment at home. In the latter group improvement is usually sufficient after 7 to 10 days to permit continuance of treatment at home. Patients are advised to eat a high calorie diet three full meals a day with lunches between meals. Physical activity is slowly increased as the improvement in each patient's condition seems to warrant it. Some patients have been confined to bed for as long as 2 to 3 weeks at the beginning of treatment. All patients, those hospitalized and then discharged and those not hospitalized are seen every 10 days to 2 weeks at the clinic or by the referring physician for routine examination and white and differential blood counts. If suspicious change in the blood is observed or any other toxic manifestation is suggested the patient is seen more often. Patients are advised as to possible toxic reactions and told to call their physician at once if any should occur.

Thiouracil is administered in a total daily dose of 0.6 gram 0.2 gram at 7 a.m., 2 p.m., and 9 p.m. This full dose is continued until the maximum benefit is obtained. At this point all hyperthyroid manifestations will have subsided with the basal metabolic rate being normal. The objection to reducing the dose of thiouracil as improvement occurs is that the duration of treatment may be pro-

longed and if the dose is reduced too rapidly the symptoms may actually increase and the treatment. Also discontinuing the thiouracil too long before thyroidectomy may permit an increase in hyperthyroidism. Our early experience with the use of thiouracil has led us to believe that thyroidectomy should not be performed before optimum improvement is obtained. Since short of this an unsatisfactory course under anesthesia and alarming postoperative reaction may occur thereby mitigating the complete benefit of preoperative thiouracil therapy.

The time required to accomplish the desirable degree of improvement necessary to permit safe thyroidectomy is determined fairly accurately from the height of the basal metabolic rate. It has been found that approximately one day of treatment with 0.6 gram of thiouracil is required for each percentage of elevation in the basal metabolic rate. For example a patient with a basal metabolic rate of +55 will require approximately 55 days of thiouracil therapy to bring the basal metabolic rate to normal. Those patients who have received Luol's solution before the administration of thiouracil responded less quickly and usually required a slightly longer period of treatment to return the metabolic rate to normal. Those patients who had had hyperthyroidism of short duration 2 to 3 months responded more quickly to treatment than did those who had had the disease a longer time. Those patients with very large glands responded more slowly but on the whole the size of the gland did not seem to be an important factor in the time necessary to reduce the metabolic rate to normal. With this knowledge individualizing the treatment of each patient the date of readiness for operation can be accurately estimated and hospital arrangements can be made far in advance. There was no patient who was thiouracil resistant and in no case was there failure to bring the basal metabolic rate to normal if treatment was continued sufficiently long.

The average initial basal metabolic rate of the first 100 patients having thyroidectomy was +49. After an average of 57 days of treatment the average basal rate was +

Three patients received thiouracil for over 100 days and 59 patients for over 50 days. The average gain in weight was 12 pounds with 19 patients gaining over 20 pounds.

Surgical procedures. Of the total 190 patients 177 were subjected to subtotal thyroidectomy and 14 patients had hemithyroidectomy. Of these latter 14 patients 4 had very large goiters and it was thought at the time of operation unwise to do a subtotal thyroidectomy. These patients were treated early in our experience before the smooth anesthesia and postoperative course of patients treated adequately with thiouracil had been observed. Since thyroid toxicity is absent the time factor in the operation is no longer important so extremely large glands are now removed at one stage. Four patients were not treated long enough with thiouracil to permit subtotal thyroidectomy without risk as indicated by an unsatisfactory anesthesia course. These cases also occurred early in our experience before optimum improvement prior to operation was thought essential. Five patients were prepared with thiouracil for second stage thyroidectomy the first stage having been performed following iodine preparation. One patient had only a hemithyroidectomy because of the extreme technical difficulty in removing a recurrent goiter. There were no postoperative deaths.

When the first patients receiving thiouracil underwent thyroidectomy a most unsatisfactory surgical complication was encountered. The thyroid gland was found to be soft and friable and bleeding of the entire operative site was so extensive that there was difficulty in keeping the field sufficiently dry to carry out the usual desired surgical technique. In addition the isolation of the parathyroid glands and the recurrent laryngeal nerves. Since 24,000 patients with goiter have been operated upon in the surgical department of the clinic all of the surgeons are familiar with all of the technical difficulties which may arise while doing a subtotal thyroidectomy in hyperthyroidism. If they complain of really distressing technical difficulties in operating upon these patients who have been prepared solely with thiouracil it must be assumed that these technical difficulties are really of serious character

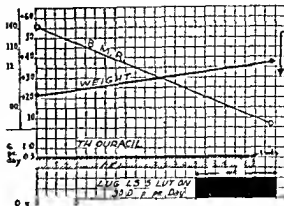


Fig. 3. Illustrative case showing combined effect of thiouracil and Lugol's solution on a patient with hyperthyroidism. Basal metabolic rate (BMR) and weight (Wt.) are plotted against time. The patient was treated with thiouracil (T) and Lugol's solution (L) for 100 days. The BMR (dashed line) decreased from 135 to 90, while the weight (solid line) increased from 105 to 135. The Lugol's solution (solid line) was administered from day 50 to day 100, maintaining the BMR at approximately 100.

acter and in no way imaginary. Hemostats, double hooks, or even ligatures fail to hold or pull out on the slightest traction. Oozing is almost ceaseless and is controlled only with the greatest patience and difficulty. It was also often impossible to do as radical a thyroidectomy as is desirable. After suffering through a number of these operations it was the opinion of the operating staff that the desirable effect of thiouracil upon the basal metabolic rate was being considerably offset by the undesirable difficulties entailed in carrying out the subtotal thyroidectomy.

The friability of the thyroid gland was overcome when Lugol's solution was administered during the 3 week period immediately before operation. For 2 weeks the iodine and thiouracil are administered simultaneously and during one week preoperatively the thiouracil is discontinued and only iodine is administered. The thiouracil is discontinued 1 week before operation since it has been determined that the basal metabolic rate continues to drop even though the thiouracil is stopped. It is also suspected that involution is furthered when thiouracil is not being administered. Also the danger of possible toxic reactions from the drug developing at the time of operation is avoided by this plan. The supplementary use of iodine preoperatively is not required in patients with adeno-

TYPE OF REACTION	Month	1	2	3	4	5	6	7	8	9	10	11	12
GOITER METABOLIC RATE	3.5	4.5	5.5	6.5	7.5	8.5	9.5	10.5	11.5	12.5	13.5	14.5	15.5
FEVER	0	0	0	0	0	0	0	0	0	0	0	0	0
NERVOUSNESS	0	0	0	0	0	0	0	0	0	0	0	0	0
EDEMA	0	0	0	0	0	0	0	0	0	0	0	0	0
WOUND HEALING	0	0	0	0	0	0	0	0	0	0	0	0	0

Fig. 1. Types of reactions in the thyroid gland. The following table shows the results of the treatment of the thyroid gland with thiouracil.

matous goiters since this type of gland is not altered by thiouracil therapy.

An example of the combined use of thiouracil is given in Figure 1. In this typical case with severe hyperthyroidism with a basal metabolic rate of +55.06 gram of thiouracil was given daily for 54 days its administration was discontinued 1 week before operation and Lugol's solution was given daily during the 3 week preoperative period. The basal rate before operation was +6. The iodine given preoperatively produced firmness of the gland the palpable thrills and bruits became less marked and at operation the thyroid was sufficiently firm so that no technical difficulty was encountered.

In patients adequately treated with thiouracil the pulse remains constant during anesthesia as does the blood pressure in contrast to the rising pulse rate and blood pressure in patients treated preoperatively with Lugol's solution alone. No evidence of toxicity is observed the anesthesia course being that seen during the removal of a nontoxic adenomatous goiter. The postoperative course is also free of reaction. The worry and concern over postoperative reactions have now been entirely eliminated. The intensive use of sedation intravenous fluid and oxygen administration postoperatively is no longer necessary. Because of these changes a revision of postoperative treatment after thyroidectomy has become necessary. Overtreatment with thiouracil which produces a myxedematous state

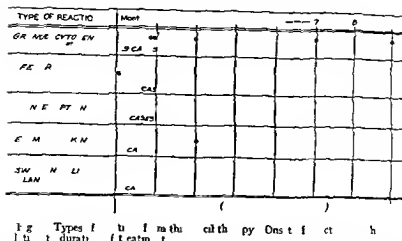
must be avoided since patients with myxedema are extremely sensitive to anesthesia and preoperative and postoperative sedation. When patients are myxedematous even small doses of sedation may suppress the respiration and with the usual presence of mucus may lead to pulmonary complications.

TOXIC REACTIONS DUE TO THIOURACIL

Toxic manifestations (Fig. 2) developed in 3 patients¹ receiving thiouracil 18 of these being in the aforementioned group operated upon. The reactions consisted of granulocytopenia 9 patients fever reactions 7 patients skin eruption 4 patients scleredema 2 patients and swelling of the salivary glands 1 patient.

Leucopenia with granulocytopenia is the most serious and alarming of all the reactions to thiouracil. The blood changes in the 9 cases occurred as early as 3 days and as late as the 9th month the dose of thiouracil varying from 0.6 to 0.05 gram daily. The changes in the blood usually occurred quite suddenly with a reduction in the total white count and in the percentage of polymorphonuclear cells. The total white counts in this group were 4700 4200 4000 3800 3850 2400 1600 1000 900 with the respective polymorphonuclear count being 12 per cent 4.5 per cent 12 per cent 23 per cent 34 per cent 36 per cent 6 per cent 0 and 0 per cent not a proportionate

¹ The following table shows the results of the treatment of the thyroid gland with thiouracil.



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An example of the combined use of thiouracil is given in Figure 1. In this typical case with severe hyperthyroidism with a basal metabolic rate of $+55.06$ gram of thiouracil was given daily for 34 days its administration was discontinued 1 week before operation and Lugol's solution was given daily during the 3 week preoperative period. The basal rate before operation was $+6$. The iodine given preoperatively produced firmness of the gland the palpable thrills and bruits became less marked and at operation the thyroid was sufficiently firm so that no technical difficulty was encountered.

In patients adequately treated with thiouracil the pulse remains constant during anesthesia as does the blood pressure in contrast to the rising pulse rate and blood pressure in patients treated preoperatively with Lugol's solution alone. No evidence of toxicity is observed the anesthesia course being that seen during the removal of a nontoxic adenomatous goiter. The postoperative course is also free of reaction. The worry and concern over postoperative reactions have now been entirely eliminated. The intensive use of sedation intravenous fluid and oxygen administration postoperatively is no longer necessary. Because of these changes a revision of postoperative treatment after thyroidectomy has become necessary. Overtreatment with thiouracil which produces a myxedematous state

must be avoided since patients with myxedema are extremely sensitive to anesthesia and preoperative and postoperative sedation. When patients are myxedematous even small doses of sedation may suppress the respiration and with the usual presence of mucus may lead to pulmonary complications.

TOXIC REACTIONS DUE TO THIOURACIL

Toxic manifestations (Fig. 2) developed in 3 patients receiving thiouracil 18 of these being in the aforementioned group operated upon. The reactions consisted of granulocytopenia 9 patients fever reactions 7 patients skin eruption 4 patients sclerodema 2 patients and swelling of the salivary glands 1 patient.

Leucopenia with granulocytopenia is the most serious and alarming of all the reactions to thiouracil. The blood changes in the 9 cases occurred as early as 23 days and as late as the 9th month the dose of thiouracil varying from 0.6 to 0.03 gram daily. The changes in the blood usually occurred quite suddenly with a reduction in the total white count and in the percentage of polymorphonuclear cells. The total white counts in this group were 4300 4200 4000 3800 3850 2400 1600 1000 900 with the respective polymorphonuclear count being 12 per cent 45 per cent 12 per cent 23 per cent 34 per cent 36 per cent 6 per cent 0 and 0 per cent not a proportionate

Fig. Thiouracil (per cent) of 96 patients

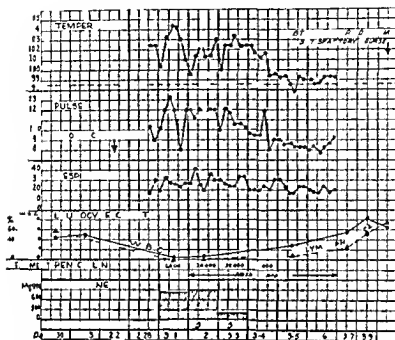


Fig 3 Agr locyt w thse lms l manifest u sd l f f g d yaft dsc t g th cl Imp em t occurred aft int t tm t (i cl l th ght t be th m t be 6 lp t ft tm t.) Mrs S K g d 36 y rs re p m ry h y p l f ye rs d rst W ght 65 t po d b sal tabol t 1 l + 85 fl l + 6 p l 4 Thu cl 6 g m daly f 75 d) G ed po d

drop. Four patients developed the clinical picture of agranulocytic angina: 2 mild and 2 severe. 1 of the latter patients died.

This patient, a woman of 41 years with severe primary hyperthyroidism, had received thiouracil 6 grs m daily for 37 days when she developed a mild sore throat. A blood count one week before showed a total white cell count of 5000, with 70% polymorphonuclear cells. The thiouracil was discontinued. She started at the beginning of symptoms, nate treatment was used. Five days later, she was admitted to the hospital; the city where she resided. The sore throat symptoms had progressed. The temperature at this time was 100.5 degrees F. The white count was 5000, and polymorphonuclear cells were seen. She was given fluid and rest, and 100 mg of penicillin with adequate fluid. She died 18 hours after the onset of symptoms.

Since that experience, a second case with severe granulocytopenia has been observed.

Febrile and throat symptoms developed 8 days after discontinuation of thiouracil. The total white count was 5000, with polymorphonuclear cells in the differential (1/3). The patient was given 100 mg of penicillin daily.

morally and by nasal and throat spray, pyridine and crude liver extract. In 48 hours, the patient showed improvement in the patient's clinical condition. In 1 day, the white blood count had returned to normal, and the patient had a subnormal thyroid reaction.

One patient with mild beginning agranulocytic angina (Fig 4) having only a slight systemic reaction also responded equally well to treatment with penicillin, pyridoxine, and folic acid. One patient had mild symptoms and recovered without treatment. The other patients who had blood changes were asymptomatic and following the discontinuance of thiouracil, the white blood cells returned to normal within 7 to 10 days.

This experience with the blood changes during thiouracil administration shows that the changes may occur at any time during therapy and that agranulocytosis may develop even as long as a week after treatment is stopped. There is no relationship between

*Given on the basis of the work of M. I. Cantor and J. W. Scott of the Univ. of Alberta, Canada. M. I. Cantor and J. W. Scott.

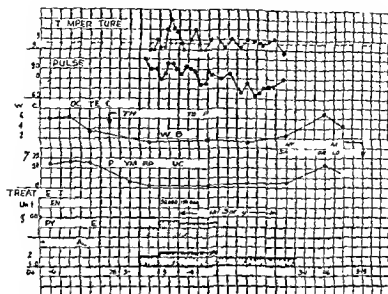


Fig 4. Agranulocytosis in old clinical material. Mrs. M. W. Grady, 66 years old, with hyperthyroidism. Thyroca dose 8 salm tabloid rat. Total 43.5 g. 1 + 0. Thyroca 56 d. 5.

the dose used and the possibility of a fatality. This makes frequent blood studies essential during treatment and careful observation and intensive therapy are necessary if agranulocytic angina occurs. Although we used other substances in the treatment of patients with agranulocytic angina, penicillin was unquestionably the potent and most beneficial agent producing recovery in the 2 patients under our care. This conclusion seems justified since it was observed that clinical improvement resulting from sterilization of the body occurred before blood changes were noted. Studies aimed at preventing the blood changes are now under way since prevention of blood changes seems essential before free use of thiouracil will be safe.

Fever with severe generalized muscular aching and pain, especially in the upper back and neck, occurred in 7 patients. A fever of 103 degrees developed on the tenth day in 6 patients. In each of these patients the fever subsided promptly on the discontinuance of thiouracil and when 0.1 gram of thiouracil was again administered a fever response with a return of muscular pain took place in 2 to 3 hours. One patient developed fever on the second day of treatment; she also had a return

of symptoms, chills, fever and nausea when a repeat dose of 0.1 gram was given. Four of these 7 patients who developed fever were then placed on thiobarbital 0.1 gram per day. Three of the 4 continued taking this substance until full control of hyperthyroidism was accomplished at which time a subtotal thyroidectomy was done. The fourth patient developed both fever and leucopenia following the administration of thiobarbital so that the treatment had to be discontinued. Further preoperative treatment in this case was carried out with Lugol's solution.

Four patients developed a severe pruritic skin rash during treatment. The rash was maculopapular in type and fairly well generalized but was particularly noticeable on the arms and around the neck. It occurred on the 21st, 34th, 44th and 48th day of treatment. In 2 cases the drug was discontinued with prompt relief of symptoms. In both of these patients the hyperthyroidism was well controlled so that thyroidectomy was done without delay. In 2 patients the hyperthyroidism was severe enough to require further treatment. In both of these the dose of thiouracil was cut to 0.3 gram a day and local skin treatment was given. The skin in

proved so that sufficient control of the hyperthyroidism could be accomplished to permit thyroidectomy without reaction. This latter experience in reducing the dose of thiouracil with resulting improvement in the skin needs further certification before this plan can be considered as the solution to the troublesome skin reaction.

In 2 patients sclerodema or early scleroderma like changes were noted. Both patients spoke of feeling muscle bound with the skin feeling tight. This was noted chiefly in the face, hand and upper arms where the skin was found to have lost its normal elasticity. This change occurred after 66 and 70 days of treatment. In 1 the basal metabolic rate was -5 and -6 per cent with the serum cholesterol 203 milligrams per 100 cubic centimeters and in the second case -21 per cent with the serum cholesterol 276 milligrams per 100 cubic centimeters. The latter patient was in a mild myxedematous state as indicated by the basal metabolic rate and cholesterol determination. Neither patient showed the clinical picture of myxedema such as dry skin and swollen lids. A biopsy of the skin from the shoulder area in the second patient showed slight edema of the collagen fibers. In both the skin condition disappeared on stopping the medication. Thyroidectomy was done even before the skin had returned to normal. Excess serum accumulation in the wound postoperatively was noted in these patients.

The twenty-third reaction consisted of marked swelling of the salivary glands. This took place on the 23d day of treatment, disappeared a few days after stopping treatment and quickly returned after 0.1 gram of thiouracil was given. The swelling was not painful and was only troublesome in preventing proper opening of the mouth. The patient was then given thiobarbital without toxic effect until optimum control permitting thyroidectomy was obtained.

These 23 reactions occurred in a total of 196 patients to whom thiouracil was administered or 11.7 per cent as compared with 78 (19 per cent) reactions in a group of 405 cases taken from the literature. (2) The blood changes most serious of all reactions leading

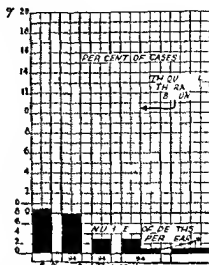


Fig 5. D p th pe tag f st ge thy d t s
d p o t pe at l e d th f o l l g t u t f i r e
p e a u t r e t m t w c h t h i

to possible death occurred irrespective of duration of administration or dose of thiouracil given. The fever reactions except in 1 case occurred on the 10th day of treatment and returned when a small dose was repeated. The skin eruption was variable in its occurrence from 1 to 48 days. In 2 patients reducing the dose by 50 per cent permitted continuance of treatment. The edema of the skin occurred fairly late in treatment when the metabolic rate was normal or the patient was in a mild myxedematous state. Swelling of the salivary glands on the 21st day was noted in only 1 case.

The reactions may be considered to have different mechanisms: (a) Blood changes and skin eruption are on a toxic basis. (b) Fever and swelling of salivary glands are due to sensitivity. (c) Edema of skin results from metabolic disturbance in the skin and subcutaneous tissue.

The use of thiouracil in the management of hyperthyroidism has permitted a great saving of life since thyroidectomy can now be done without risk. In the last 2 years since the introduction of thiouracil there have been 3 postoperative deaths. These patients were not given thiouracil but if it had been given their deaths could probably have been prevented. When it is remembered that the

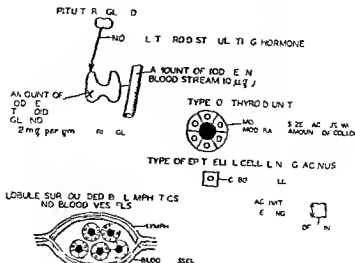


Fig 6 D grammatic utilization of the normal thyroid physiology

thiouracil treated patients were all severely toxic and represented serious surgical risks the value of thiouracil can truly be appreciated. Since the introduction of thiouracil two stage procedures have fallen from the usual 10 to 12 per cent to 3 per cent (Fig 5). No more two stage operations need be done except for technical reasons. In addition to the lessening of postoperative deaths and the reduction in multiple stage operations a great economic saving was possible in the group of hyperthyroid patients treated since the hospital stay now is 7 to 10 days as compared with weeks when patients were prepared with Lugol's solution and the expense of multiple operations is also eliminated.

COMPARISON OF LUGOL'S SOLUTION WITH THIOURACIL ON THYROID GLAND

Before an approach is made to an explanation of the action of thiouracil and to the combined effects of thiouracil and iodine upon the thyroid gland it may be of interest to discuss a few of the fundamental features of iodine effect upon the thyroid gland as related to its vascularity and friability. These include the effects of iodine upon the histology of the thyroid gland upon metabolism and upon blood iodine as shown by blood iodine studies. An attempt can be made to explain how thiouracil operates how iodine functions

the relation of iodine to thyroxine what involvement of the thyroid is and how desirable it is to obtain the combined effects of thiouracil and iodine in the patients with hyperthyroidism coming to operation.

If we assume that the present conception of hyperthyroidism is sound it is possible to illustrate diagrammatically hyperthyroidism with only one factor missing that is what incites the excess of the pituitary thyroid stimulating factor. It can be shown that as the result of overstimulation of the thyroid there is resulting hyperplasia and that as the result of this stimulation and hyperplasia there is a greater production of thyroid secretion which brings about hyperthyroidism with such dramatic clinical evidence of its effect upon body metabolism.

A normal thyroid physiology is schematically indicated in Figure 6. The thyroid gland receives stimulation from the thyroid stimulating hormone from the pituitary gland and iodine is taken from the blood stream for the production of thyroid hormone. The normal gland contains 2 milligrams of iodine per gram of dried gland and in the blood at this time there is only 10 micrograms per cent of iodine. The thyroid gland structure has as a unit an acinus which is lined with cuboidal cells. The acinus contains a moderate amount of well staining colloid the latter represents

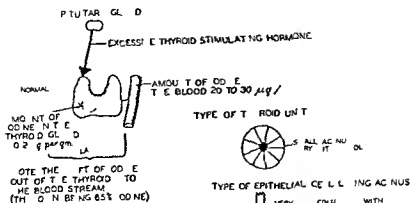


Fig. 2. Diagram illustrating the phylogeny of primary hyperthyroidism.

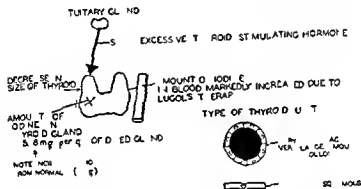


Fig 8. Diagram illustrating the physical properties of the primary type of the drilling fluid system.

the normal stored thyroid hormone. The acini are grouped forming a lobule which is surrounded by blood vessels and lymphatics. Movement of thyroid hormone to the body and manufacture of hormone with storage as colloid is dependent on the body's varying requirement for hormone.

b When hyperthyroidism with its typical hyperplasia occurs it can be shown diagrammatically as in Figure 7. An excess of thyroid stimulating hormone causes an overactivity of the thyroid gland due to hyperplasia of the thyroid cells with increased vascularity. The lining cells of an acinus of the hyperplastic thyroid are high columnar loosely packed with crinkled edges bulging into the acinus. The type of hyperplastic thyroid gland is friable and bleed profusely. A shift takes

place in the iodine from the gland to the blood stream with the thyroid containing one tenth of the usual content of iodine and the blood stream two to three times its normal content

c Involution of the hyperplastic hyperthyroid gland can be accomplished by the administration of Lugol's solution (Fig 8). There is still an excess of thyroid stimulating hormone. The thyroid cell reverts to an inactive phase becoming flat and compact appearing to be compressed by the large amount of colloid stored in the acinus. Iodine is increased in the gland up to 5 to 8 milligrams per gram of dried gland. It is this type of acinar distention with a lessened need for an increased blood supply that makes the hyperplastic thyroid become firm so that it is no longer friable. This reduction in vas-

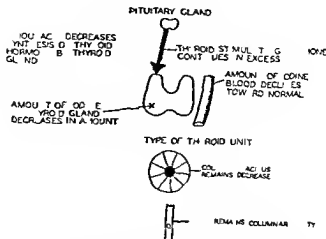


Fig 9 Diagram illustrating the physiological changes in the thyroid gland during hyperthyroidism and the effect of thioauracil treatment.

cularity of the thyroid is demonstrated by a lessening of the thrills and bruits at the superior thyroid pole following iodine administration. At operation a properly iodinated gland shows little bleeding and when incised is pale and relatively dry and on section the dilated acini filled with colloid are readily seen.

d The exact mechanism of thioauracil action still remains somewhat in doubt. Certain studies suggest its action to be as shown in Figure 9. The pituitary stimulation continues to remain in excess. A disturbance in the synthesis of the thyroid hormone takes place and coincident with this there is a decrease in the iodine content of the thyroid gland. A reduction in the blood iodine occurs and the blood iodine level gradually returns to normal as the basal metabolic rate falls. If thioauracil therapy is continued sufficiently long a normal blood iodine content is finally reached. The thyroid cell still shows evidence of hyperplasia as during active clinical hyperthyroidism. This continued hyperplastic state of the thyroid following thioauracil treatment accounts for the increased vascularity of the gland. Bruits and thrills are present at the superior poles together with softness of the gland and at operation excessive bleeding causes technical difficulty. If the thyroid gland is in a high state of hyperplasia at the time thioauracil treatment is begun the hyper-

plasia is increased as noted by the development of marked softness of the gland. If however the gland is firm spontaneously involuted at the time of starting treatment the gland does not seem to undergo a great hyperplastic change. Therefore the clinical status of the thyroid gland following thioauracil treatment is dependent on the condition of the gland when treatment is begun.

e The fifth comparative step in the altered thyroid physiology is that which occurs following the use of combined thioauracil and iodine in preparation of the thyroid gland for its removal. Since thioauracil tends to produce a highly vascular gland an attempt at preventing this was made by a combination of thioauracil and iodine administration. Thioauracil was begun and continued up to 1 week before operation with iodine being administered with thioauracil during the last 2 weeks of its use and alone for 1 week before thyroidectomy (Fig 11). Clinically a substantial improvement in the gland occurred—the bruits and thrills lessened the gland seemed to be reduced in size and at operation the thyroid was adequately involuted it was not friable and bleeding could easily be controlled.

Diagrammatically (Fig 10) the pituitary stimulation is apparently still in excess with thioauracil decreasing the synthesis of thyroid hormone. The thyroid gland is still able to take up iodine when given as Lugol's solution.

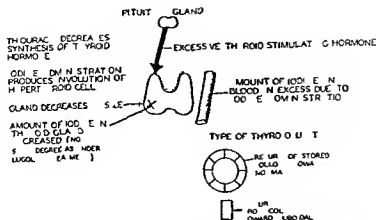


Fig. Diagram illustrating the physiological changes in the thyroid gland after thiouracil treatment.

producing involution there being no complete block to iodine absorption. The gland seems to decrease in size and becomes firm with lessening of the bruits and thrills at the superior poles. Iodine however must be administered before myxedematous levels are reached since absorption does not seem to take place at that stage of metabolism. The iodine content of the thyroid tissue removed at operation is found to be greater following combined thiouracil and iodine treatment than following thiouracil therapy alone (Fig. 1). An excess of iodine occurs in the blood as a result of iodine administration. Histologically a tendency to involution occurs but not to the degree seen with iodine treatment alone.

PATHOLOGIC OBSERVATIONS ON THYROID TISSUE AFTER THIOURACIL ONLY AND AFTER THIOURACIL AND LUGOL'S SOLUTION

A careful pathologic study of thyroid tissue removed at operation was carried out on 77 specimens. These patients were among the first 100 treated and include those patients treated with thiouracil alone and those receiving the combined iodine and thiouracil management.

Particular attention was directed to the state of involution of the gland. For a number of years we have classified the degree of involution on the basis of microscopic findings dividing it into three stages: early involution when the epithelium is still col-

umnar and the colloid scanty and papillary projections present; moderate involution when the epithelium is cuboidal the colloid moderate in amount and papillary projections not frequent; late involution when the epithelium is low cuboidal or flat, colloid fills the acini and is usually fairly dense and homogeneous and the papillary projections are vestigial. At times instead of each acinus involuting more or less at an equal rate there is a mixture of the three preceding stages; this is designated irregular involution. Some glands usually those with late involution may show foci which we classify as hyperinvolution when the picture almost resembles that of a colloid goiter with flat epithelium and distended acini containing much colloid the acini remain less than a low power microscopic field in diameter as a rule the fibrous stroma is not as abundant as seen in a colloid goiter nor does it become loose and edematous as is so often the case in a colloid goiter.

Varying degrees of involution may occur spontaneously in hyperplastic thyroid glands as a result of the diminution of blood supply as through pole ligation as a result of removal of a portion of the thyroid as a result of radiation or as a result of iodine administration. By examination of involuted glands it is not possible to state by what means the involution has occurred.

Fibrosis and lymphocytic infiltration are not essential features of involution nor of the effect of iodine or other substances admin-

TABLE III —DIAGNOSES (PATHOLOGIC) ON PRIMARY GLANDS

	Thiouracil per cent	N thiouracil per cent
Primary with lymphoid	19	6
Primary with thyroiditis	0	26
Primary with thyroiditis	5	22
Primary with thyroiditis	5	8

group varied from 6 grams to 113 grams. Only one specimen was extraordinarily heavy. This was from a patient treated with both thiouracil and iodine and diagnosed as primary hyperplasia with early involution; the two lobes together weighed 225 grams. Those cases which were diagnosed as secondary hyperplasia were too variable to permit comparisons.

Microscopically neither cells nor colloid appeared different in any respect from glands in the same stage of involution histologically when patients had not received thiouracil. In Table II is an analysis of the amount of lymphoid infiltration and stromal increase in the glands with the diagnosis of primary hyperplasia. Here again there was no uniform increase or decrease and nothing greater or less than might be expected in a control group. The degree of lymphoid infiltration was somewhat greater in patients over 40 years of age. The length of time that the patient had received thiouracil or iodine made no apparent difference in the lymphoid or stromal response.

EFFECT OF THIOURACIL ON INVOLUTION

It would be reasonable to expect from the results of the administration of thiouracil to animals that thiouracil given to thyrotoxic patients might keep the gland in a state of histologic hyperplasia and that there would be little evidence of involution in many of the glands even if iodine were given in addition. It has been noted (1, 3) that iodine added to the diet did not prevent the thiouracil effect on animals. Table III is a tabulation of the various pathologic diagnoses made on the primary hyperplastic glands when the patients had received thiouracil compared with a control group of 100 random primary hyperplastic glands of patients who had received only iodine. Although the thiouracil treated case tend to show a higher incidence of early

TABLE IV —DIAGNOSES ON PRIMARY GLANDS IN RELATION TO IODINE THERAPY

	Thiouracil only	Thiouracil d previous iodine	Thiouracil d reopera- tion	Thiouracil d and p vi-cope a-ve- tosh
Primary with early involution				3
Primary with moderate involution			7	
Primary with late involution			9	6
Primary with irregular involution				3

involution—that is there is considerable histologic evidence of activity—there are still numerous instances of later stages of involution.

Since few patients in whom the diagnosis was primary hyperplasia had not received iodine at some time or another we must assume that the majority of the patients showed a picture which may have been influenced in part at least by the iodine. Table IV is a tabulation of the diagnoses made on the primary hyperplastic glands according to the time that the iodine was received in relation to the thiouracil treatment and the operation. Iodine did not constantly inhibit or further involution no matter when it was used.

In order to determine more critically the response of the gland to thiouracil an estimation of the histologic degree of activity of the thyroid was made in terms of basal metabolic rate points. While such estimations are only approximate in the majority of cases with primary hyperplasia they are reasonably accurate. Cases of secondary hyperplasia were not considered in this manner because of the numerous irrelevant distorting features. The degree of activity thus estimated was compared with the basal metabolic rate at the beginning of thiouracil treatment. A definite

TABLE V —HISTOLOGIC EVIDENCE OF INVOLUTION IN PRIMARY GLANDS

	Thiouracil only	Thiouracil d previous iodine	Thiouracil d preope- ration	Thiouracil d preope- ration
No definite involution	1	0	8	6

involutionary response was considered one in which the basal metabolic rate appeared to have dropped at least 10 points during the treatment. In Table V the responses noted are tabulated. The majority of the specimens showed involution. Only three glands showed an apparent increase in histologic activity during the treatment and two of these patients had had iodine. In 40 of the 47 cases the clinical response to thiouracil therapy was considered good as shown by a marked fall in the basal metabolic rate.

The degree of involution or lack of involution was not found to be dependent upon the manner in which iodine was given or upon age, sex, duration of symptoms or duration of thiouracil treatment.

Gland classified as secondary hyperplasia while more difficult to analyze in this manner seemed to show similar involutionary changes.

COMMENT

Since relatively few of the patients of this series received only thiouracil as the preoperative medication, the comments and discussion must be limited chiefly to observations on the effect of thiouracil when it is used in conjunction with iodine.

The effects of thiouracil alone on gland from thyrotoxic patients are seemingly similar to the effects on glands of experimental animals according to the reports of Moore and associates and Williams and Clute. Their specimens showed evidence of marked activity and with this the usual accompanying features of histologic activity such as increased size, vascularity and height of epithelium, loss of colloid, small acini, frequent lymphoid infiltration and so forth. However we do not believe that this thiouracil effect differs in any way from the picture seen in a hyperplastic gland in a comparable state of activity in which no thiouracil has been used. There are no additional or pathognomonic features present in a thiouracil treated gland which may not be present in a hyperplastic gland when thiouracil has not been given. In our opinion it is not possible to examine a gland and to say from the gross or microscopic appearance of such a gland that the patient has had or has not had thiouracil treatment.

In the series of Williams and Clute (27 resected specimens) and of Moore and associates (26 resected specimens) there was a apparently little evidence of involution except in one case of the latter series. In each of the patients were treated with thiouracil alone. These results contrast with the findings in our series in which the majority showed evidence of involution when treated with both thiouracil and iodine. Rawson in comparing the appearance of biopsy specimens taken prior to thiouracil treatment to the histologic appearance of the gland in the surgical specimens removed later, concluded that in 4 of his 5 cases there was evidence of increased activity while in 1 case about the same degree of activity was evident. It would appear that while thiouracil alone infrequently causes (or allows) definite histologic involution in a thyrotoxic patient, the addition of iodine to the treatment either before or after the thiouracil is administered may alter the microscopic picture considerably with many cases showing good histologic involution.

It is difficult to place an interpretation on these results largely because neither the cause of hyperthyroidism nor the mechanism of action of thiouracil or iodine is well understood. The addition of iodine to the thiouracil treatment did not cause involution routinely nor as frequently as when iodine was used alone preoperatively. It was impossible to correlate the degree of histologic involution with such factors as age, sex, duration of symptoms, severity of symptoms or length of time of either thiouracil or iodine therapy.

It has long been known that spontaneous remission of the symptoms of hyperthyroidism accompanied by morphologic evidence of involution in the thyroid gland may occur. Our material derived from thyroidectomies prior to the time when iodine came into general use as a method of preoperative medication showed frequent evidence of spontaneous involution. A few patients after treatment with thiouracil alone have apparently been able to discontinue the drug without recurrence of thyrotoxic symptoms. Perhaps the involution found in some cases is a manifestation of a spontaneous remission and is independent of the thiouracil effect.

SUMMARY AND CONCLUSIONS

1 Thiouracil has been proved to be a most valuable drug for the preoperative preparation of patients with severe hyperthyroidism.

2 The drug must be administered until the maximum benefit is obtained and at that time subtotal thyroidectomy can be carried out without risk. The dose of thiouracil used was 6 gram a day and it was found that approximately one day of treatment was required for each percentage of elevation in the basal metabolic rate. Previous administration of Lugol's solution prolonged treatment and those patients with hyperthyroidism of short duration responded more quickly.

3 The technical difficulties at operation which occurred in patients treated only with thiouracil have been overcome by the added use of Lugol's solution during the 3 week period immediately before operation; no thiouracil is given during the week immediately before operation.

4 Since thiouracil cannot be given without danger—evidence of toxicity occurred in 11 per cent of patients treated—patients must be carefully observed during treatment. Granulocytopenia is the greatest potential danger so frequent blood tests are imperative.

5 Diagrammatic comparison is attempted of the altered pathologic physiology in the thyroid gland from normal during hyperthyroidism under treatment with Lugol's solution following thiouracil and lastly with combined administration of thiouracil and Lugol's solution.

6 The results of the study of 77 thyroid glands surgically resected from patients with hyperthyroidism who had been treated preoperatively with thiouracil are reported.

Twelve of the patients were treated with thiouracil alone; the remainder had iodine in

addition at some stage of the course of treatment.

7 From the gross and microscopic examination of an individual gland no specific effect was found which might be attributed to thiouracil. It was not possible to identify a thiouracil treated specimen from a hyperplastic gland which has had no previous thiouracil therapy. However some thiouracil treated glands are larger than would be expected from the clinical course or microscopic picture.

8 The increased vascularity of the gland noted by the surgeon in those patients treated with thiouracil is of course not apparent in pathologic material.

9 When iodine is used in conjunction with thiouracil the majority of the specimens show histologic evidence of involution especially when the microscopic picture is compared with the initial basal metabolic rate.

10 The addition of iodine to the treatment either before or after thiouracil is administered did not constantly bring about histologic involution; moreover the incidence of involution was not as frequent as when iodine was used alone.

11 It was not possible to correlate the degree of histologic involution in this series with such factors as age, ex duration or severity of symptoms or duration of either thiouracil or iodine therapy.

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ESOPHAGOGASTROSTOMY IN THE TREATMENT OF CARDIOSPASM

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ESOPIIAGOGASTROSTOMY is not intended as an initial procedure in the treatment of cardiospasm. The vast majority of patients who have cardiospasm obtain excellent results from dilatation of the cardia by means of the hydrostatic dilator and it is only in the exceptional case that surgical intervention becomes necessary (10). It is not our purpose to review the general subject of cardiospasm which has been very ably done in recent publications by Ochsner and DeBakey (11-12) Gray and Skinner and others. It would appear from a review of the literature of those cases of cardiospasm or achalasia of the esophagus in which surgical treatment was used that the best results were obtained in the group on which esophago gastrostomy was performed. Of the various surgical procedures employed in general those done through a transpleuroneal approach have carried a much lower operative mortality rate than have the transpleural procedures.

As was pointed out by Lambert 30 years ago and recently emphasized by Gray and Skinner dilatation of the esophagus in cardiospasm usually assumes one of three typical forms: fusiform, flask shaped or sigmoid shaped. In the fusiform type the lumen of the esophagus increases to a point midway between the cricoid cartilage and the cardia and then tends gradually to decrease in size. In the flask shaped variety the dilatation is immediately above the cardia. In both of these types the cardia is the most dependent portion of the dilated esophagus and both can usually be relieved by hydrostatic dilatation. Cardiospasm in which the esophagus elongates as well as dilates and therefore becomes sigmoid shaped is the rarest of the three types. Here the increased length of the esophagus is accommodated by a curved course. The most dependent point of the dilated esophagus rests on the diaphragm to the right and posterior to the cardia. The esophagus then ascends to the left and enters the abdomen through the diaphragm at a higher level. A reservoir is thus formed below the level of the cardia. Gray and Skinner have pointed out that

this a gulation and this reservoir make dilatation from above more difficult and may result against a satisfactory result.

We have recently operated on 4 patients with cardiospasm of long standing in whom dilatation of the cardia had failed to produce more than temporary relief. The operative procedure employed in these 4 cases was esophago gastrostomy. Although in each case a good functional result was obtained the dilated esophagus did not appear to reduce appreciably in size following operation. An observation has also been noted after esophageal dilatation.

Cases: A white female aged 57 years first seen May 1944. History: Cardiospasm of long standing. Dilatation of the cardia had failed to produce more than temporary relief. The operative procedure employed in these 4 cases was esophago gastrostomy. Although in each case a good functional result was obtained the dilated esophagus did not appear to reduce appreciably in size following operation. An observation has also been noted after esophageal dilatation.

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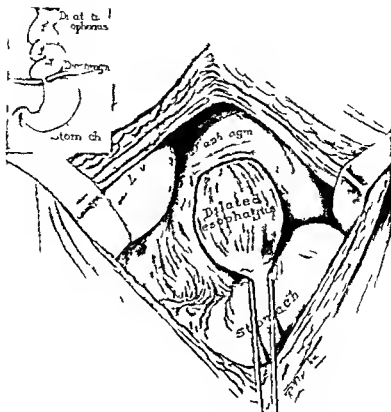


Fig. 4. Operation for dilatation of the esophagus.

the patient was first placed on the left side of the table. The incision was made in the abdominal wall, and the stomach was exposed. The dilated esophagus was identified and the surrounding tissues were dissected. The stomach was then resected, and the remaining portion of the esophagus was anastomosed to the stomach. The patient recovered well and was discharged on the tenth day.

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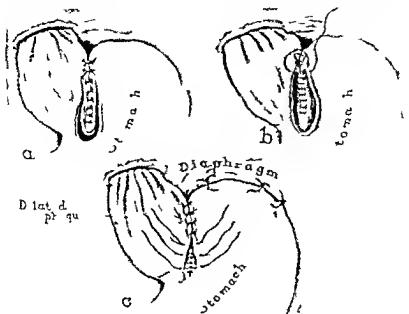




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Fig 1. Left: Contrast esophagogram showing dilated esophagus. Right: Contrast esophagogram showing dilated esophagus after transabdominal esophagostomy.

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The great majority of patients suffering from cardiospasm can be treated successfully by hydrostatic dilatation of the esophagus. Approximately 90 per cent of these patients are completely relieved by one course of treatment. In 30 per cent of cases there is a tendency for the condition to recur. The recurrence may take place at any time from immediately after treatment to as much as 3 years after treatment. If the condition does recur the great majority of patients can be successfully relieved by subsequent dilatation. Dilatation of the esophagus by means of the hydrostatic dilator can be employed with very little risk. In our experience the risk has been less than 1 per cent. In approximately 10 to 20 per cent of cases hydrostatic dilatation does not prove efficacious and in these cases surgical intervention is indicated.

Of the surgical procedures which have been recommended we prefer esophagogastrostomy

performed through a transabdominal approach. A review of the literature and our own results indicate that this is a safe procedure which accomplishes good results. Although good functional results are obtained one should not expect retrogression in size of the dilated esophagus after the operation.

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CHONDROMALACIA OF THE PATELLA

EDWIN F CAVE MD FACS Col n I MC AUS

CARTER R ROWE MD M I MC AUS I

LESTER B K YEE MD C pta MC AUS Bo t Mas ch tt

CHONDROMALACIA of the patella is a pathological entity and may be a cause of internal derangement of the knee. Buedin first drew attention to its ure formation of the cartilage in 1906 and again in 1908 by reporting 15 cases in which operation had been performed. In 1910 Ludloff reported one case. Ahausen in 1919 considered trauma to be the etiological factor and drew attention to the symptoms and physical signs in this condition. He advised excision of the impaired cartilage. Aleman is credited with first using the term chondromalacia of the patella in 1916. Kaeson followed Aleman's patients over a period of years and in 1940 reported additional cases. The works of Aleman, Karlén, Sjöström, Obermiedermayr and Östre are the most complete investigations of chondromalacia of the patella with follow-up examinations of the majority of cases in which operations had been carried out. Their conclusions as to the progress of the disease may be summarized as follows: 1st phase—patellar contusion; the cartilage becomes fluid phase—chondral malacia; the cartilage being ruptured and split by longitudinal and transverse fissures; 3rd phase—degenerative chondral change and synovitis.

Of 14 consecutive knee arthroscopies performed at the 103th General Hospital for internal derangement there were 9 cases (67%) in which the cause of the derangement was found to be degeneration of the articular cartilage of the patella. This study is based upon the 9 cases and similar one in which operation was done by one of us (E. F. C.) in clinical practice. The relative frequency of curvature suggests that the condition in the adolescent or the young adult is not uncommon and is frequently overlooked because (1) while the history is suggestive of internal derangement of the knee the physical examination is inconsistent largely because of the difficulty in examining the articular surface of the patella (2) the roentgenogram of the patella is negative (3) at operation adequate explanation of the patella is frequently not worked out.

Chondromalacia of the patella may be the sole cause of symptoms or it may be the latest stages of development associated with other patho-

logical changes in the joint. The commonest associated changes are osteochondritis and to the femoral cartilages.

PATHOLOGICAL CHANGE

The typical appearance of well advanced chondromalacia of the patella resembles shredded meat. The articular surface of the patella presents a softened area with multiple irregular fractures of the hyaline cartilage with particles of cartilage detached at the margin of the area (Fig. 1). In our case the size of the area varied from three eighths of an inch in diameter to essentially the entire surface of the patella. The location is not fixed in the center of the patella (Fig. 2) but at times the changes occur at the inferior margin or at the medial border. The area of softening extends about one inch in the center and to a distance of one inch of the area the changes are more superficial. Not uncommonly small cartilaginous bodies are detached from the degenerated area and are free in the knee joint. These become rounded and smooth. As time goes on these loose bodies may be partially or completely calcified (Fig. 3). The earliest changes in the joint may remain confined entirely to the patella but after months or years as abnormal friction between the patella and the femur develops the secondary changes occur. The changes are then taken into account of the varus deformity of the margins of the femoral and tibial condyles and partial destruction of the articular cartilage of the last bony contact. The femoral condyle where they are in contact with the gliding patella.

Microscopic changes consist in a patchy irregular area of cartilage cells. The articular cells become quite cellular. The cartilage produced by the cells is irregular in surface contour but does not differ in the respects from the normal. The amerection is frequently seen about the peripheral cartilage loose bodies. The reaction is completely synovial and is associated with fibrin in the synovial fluid (Figs. 3 and 4).

DIAGNOSIS

The diagnosis of chondromalacia of the patella is not too difficult. The history of the symptoms is suggestive of internal derangement of the knee. The physical examination is suggestive of internal derangement of the knee. The roentgenogram of the patella is negative. At operation adequate explanation of the patella is frequently not worked out.

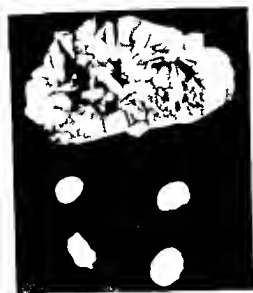


Fig. 1. Patella after removal of loose bodies and chondromalacia. (Case 1)



Fig. 2. Patella showing large loose body. (Case 2)

in the same joint. One should exercise great care in palpating the articular surface of the patella by displacing it from side to side during the examination. Local tenderness under the patella may be the only positive finding and even this may not be present if the pathological changes are confined to the center of the articular surface. It may be possible to produce pain by pressure upon the joint over the patella with the knee acutely flexed.

Medical history. In a series of 11 cases symptoms were precipitated by an indirect trauma of the knee in 5, a direct blow on the patella in 3, whereas in 3 there was no detectable history of injury.

Symptoms. Pain was present either intermittently or continuously in all cases. Secondary irritation with frequent catching, a sensation of weakness or giving away of the knee and limitation of full locking of the joint both of these cases loose bodies were found at operation.

Physical examination. On physical examination the symptoms presented were variable but 6 of 11 patients had the following findings: tenderness along the medial border of the patella and in the area epipatellar as manifested either from the tibial tubercle or the distal femur.

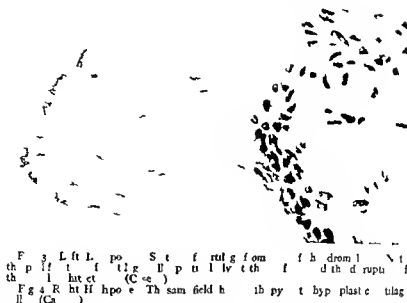
tenderness over the mesial articular surface of the patella. It is probable that in some cases this very important sign was not looked for as diligently as it might have been. Tenderness along the mesial knee joint line was recorded in 6 cases. The reason for this finding is not clear. In 2 cases the patella was abnormally mobile laterally.

Therefore given a patient with a history of intermittent pain over the anterior aspect of the knee associated with a momentary sensation of catching followed perhaps by slight stiffness and moderate swelling of the joint with atrophy of the thigh and tenderness along the mesial border of the articular surface of the patella one should strongly consider the diagnosis of chondromalacia of the patella.

X-ray diagnosis. In all 11 cases roentgenograms of the patella were negative. In 3, however, there was evidence by roentgenograms of osseous loose bodies in the joint which presumably took origin from the inferior surface of the patella and in 1 case there was moderate calcification of the tibial collateral ligament.

TREATMENT

The form of treatment to be employed is determined by the severity of the symptoms in the individual case.



If the symptoms are mild and cause only an occasional disability from the knee even though the diagnosis of chondromalacia of the patella may be reasonably certain operation should not be carried out until the patient has been observed over a period of time and then only if symptoms increase in severity. During this time exercises to maintain strength in the quadriceps muscles should be carried out.

In a patient with moderately severe symptoms with an occasional locking or rather frequent catching in the knee which may be followed by pain, swelling and stiffness operation is probably indicated. The knees should be explored through a parapatellar incision and if the area of disintegrated cartilage is of moderate size complete excision of the area should be carried down to bone. Loose cartilaginous bodies should be diligently searched for.

If an extensive area of chondromalacia is found covering essentially the entire surface of the patella or if the edge is marked eburnation and thickening of the patella the fourth or final stage of the process one of two operative procedures is indicated: (a) A patellarplasty consisting in horizontal resection of approximately two-thirds of the patella with interposition between the bony surface of the patella and femoral condyle of a flap of fat and synovia turned upward from the infrapatellar region or (b) complete removal of the patella. In all of our cases the changes in the patella found at operation were either moderately severe or extensive.

In 9 instances the degenerated area was removed by a sharp excision down to bone. In all of these there were cartilaginous bodies lying free in the joint which were all removed. In 3 of the 9 some of the loose bodies were calcified. In 1 patient the change was so severe as to warrant patellarplasty. In 2 patients with associated recurrent lateral slipping of the patella the tibial tubercle in each was transplanted medially. In 1 case was the patella completely removed.

END-RESULTS IN 11 CASES

Six patients were returned to full military duty where they have remained for at least 1 year after operation. Three patients were returned to limited service duty following operation. One has remained at limited service duty for 17 months. The remaining five were returned to the United States because of chronic synovitis of the knee after period of duty of from 3 to 5 months. The first of these returned to school activities. One was completely relieved by operation. The other was definitely improved in that locking of the knee was eliminated but occasional catching of the knee persisted.

It is impossible to know the final disposition of all of the patients at the end results of the treatment cannot be determined until a period of years has elapsed. Therefore all of them should be followed at early intervals to determine whether or not traumatic changes in the joint develop to sufficient degree to interfere with the normal function.

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CHANGES IN CHRONAXIE DURING DEGENERATION AND REGENERATION OF EXPERIMENTALLY PRODUCED LESIONS OF THE SCIATIC NERVE OF THE CAT

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TO be an effective stimulus for nerve or muscle an electrical current must be of a certain liminal strength and must flow for a certain liminal duration of time. As the duration of the stimulus is shortened so must the strength of the current be increased. When one plots the strength of the current necessary to produce contraction of a muscle against the durations of the current a strength duration curve is obtained. In general it is difficult to compare the whole of such a curve obtained at one time of degeneration or regeneration with the whole curve obtained at another time. It is also difficult to compare a whole strength duration curve obtained from the examination of one person to that of another. In part this is due to the fact that the curve bears a certain relationship to the rheobase or the minimal current which will stimulate muscle or nerve at long durations usually over 5 second and frequently designated as of infinite duration. For this as well as other reasons concerned with the kinetics of stimulus it has been found more desirable to compare some point on a curve to a similar point on another curve. Such a point is the time constant designated as chronaxie. This is the current duration at which the strength of the current necessary to produce contraction of muscle by a current of infinite duration (rheobase) is doubled.

Since the early work upon this time constant chronaxie by Lapicque and Lucas many investigators have contributed to its study. For the most part the studies have been conducted by physiologists. Just as it had been found that muscles which contract and relax slowly have a longer chronaxie and those which contract rapidly have a shorter chronaxie so was it found that when a muscle was denervated and its contraction and relaxation slow its chronaxie increased markedly. Although the chronaxie of different

muscles of man each have a somewhat different chronaxie the average chronaxie of the normal muscle is a fraction of a millisecond usually less than 0.5 milliseconds that for the flexor sublimis digitorum for example being 0.00021 second. When the muscle is denervated the chronaxie may be increased over 100 times or more.

The reason for this is stated by Watts as follows. The great increase in the chronaxie observed in human subjects after denervation is due not to any alteration in the time constants of the muscle fibers but merely to the point of incidence of the stimulus shifting from nerve to muscle. Since the time constant for nerve is short (0.0003 second or less) and that for muscle is long (0.008 second or more) the chronaxie of the denervated muscle in which no nerve is present will be found to be quite long. This marked contrast between the short chronaxie of the normal muscle and the long chronaxie of the denervated muscle has led to the use of determination of chronaxie as a procedure for the diagnosis of the severity of a lesion of nerve and prognosis as to its recovery.

Many have reported upon the use of chronaxie determinations in man for diagnosis and prognosis. Among them may be mentioned Bourguignon.

Modifications based upon the same principles of kinetics of stimulus have likewise been used very widely during World War I such modification was the Lewis Jones method of using a constant strength of voltage to determine the minimal duration at which contraction of muscle occurred.

The use of these methods has not found much favor among American neurologists and neurosurgeons. This is partly due to the fact that different types of apparatus gave different results that in many cases apparatus was faultily designed that accurate measurements of current and time could not be made by methods employing condenser discharges and largely because of the tedious character of the examination and time necessary.

In the literature dealing with the use of chronaxie as a diagnostic and prognostic procedure in

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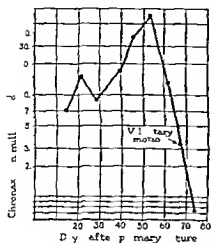


Fig. 3. Th. l. t. f. h. a. g. e. s. m. h. u. f. t. h. g. a. t. o. c. m. m. s. c. l. t. r. v. d. y. s. f. l. l. p. r. i. m. a. r. y.

man it is difficult to find reports of measurements performed at regular intervals after injury or suture throughout the period of degeneration denervation and regeneration. Rather there is found one measurement sometimes more of many different cases at different stages of change in muscle. For that reason we do not have a clear understanding of the evolution of changes in chronaxie after denervation and during regeneration. That the enormous lengthening of the chronaxie is a clear indication of denervation cannot be questioned. A number of other questions require an answer. First what are the changes that indicate recovery. Second do they antedate re-

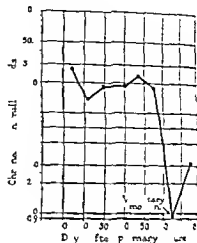


Fig. 3. Th. l. t. f. h. a. g. e. s. m. h. u. f. t. h. g. a. t. o. c. m. m. s. c. l. t. r. v. d. y. s. f. l. l. p. r. i. m. a. r. y.

covery of motion or sensation. Third does the determination of chronaxie give as early and accurate indications of recovery as other methods?

To answer these questions we sectioned a sciatic nerve immediately sutured the sciatic nerve of a cat at a regular and frequent interval. The muscles supplied by the injured and later regenerated nerve were stimulated by square wave currents of varying durations and strength. Duration curves plotted. A study of the evolution of the changes in chronaxie was made possible and these changes were compared to strength duration curves obtained from the examination of denervated and recovering muscle in man. As a result of this study certain conclusions will be made.

METHOD

The method for obtaining an impulse of rectangular wave shape lasting for a little as a few microseconds has been described by us before (5). The duration of the impulse as controlled by two gas filled triodes one of which served to initiate the flow of current while the second served to stop it. A constant flow of current through the tissue was maintained by a pentode operated on the saturated portion of its characteristic. Three different time intervals selected to conform to a logarithmic scale were made available. The indifferent electrode placed over the heel measured 15 centimeters the electrode 4 centimeters was placed over the belly of the muscle. The rheobase was determined by finding the threshold value of current when the impulse lasted 1 second. Then threshold values of current were found successively shorter durations of the

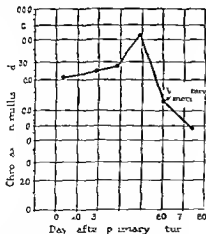


Fig. 3. Th. l. t. f. h. a. g. e. s. m. h. u. f. t. h. g. a. t. o. c. m. m. s. c. l. t. r. v. d. y. s. f. l. l. p. r. i. m. a. r. y.

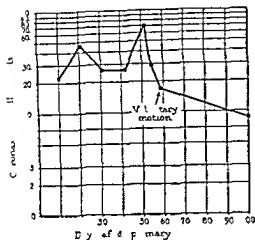


Fig 4 Th l t f ba ge ch na fih gas
1 oc em us muscl t d ys fill g p am ry
i re f th soat

impulse. It was possible to use as much time as was necessary to observe the amperage in a suitable milliammeter by shunting the specimen out of the circuit thereby avoiding painful unbearable stimuli and severe polarization changes.

RESULTS

Our first examination was made usually from the 6th to the 14th day after the primary suture. Then examinations were made from 5 to 7 days apart until motor function had well recovered. In all of the gastrocnemius muscles of the 5 cats at the 9th 10th 13th 14th and 5th day the chronaxie had lengthened from a fraction of a millisecond to 21 34 27 and 7 millisecond (Fig 1 2 3 and 4). In 4 of the 5 animals the chronaxie continued to lengthen somewhat from 2 milliseconds at the 9th day to 47 milliseconds at the 27th day from 34 millisecond at the 10th day to 35 milliseconds at the 13th day to 24 milliseconds at the 27th day and 15 milliseconds at the 4th day to 15 milliseconds at the 21st day.

Then in 4 of the 5 animals the chronaxie shortened from 47 milliseconds at the 27th day to 26 milliseconds at the 31st day from 35 milliseconds at the 13th day to 15 milliseconds at the 27th day from 27 milliseconds at the 14th day to 13 milliseconds at the 21st day and from 15 milliseconds at the 1st day to 58 milliseconds at the 27th day.

This shortening in chronaxie at times to one half of that present before is of course not an indication of recovery. That a shortening of chronaxie occurs at this time during the late of

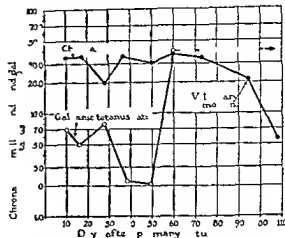


Fig 5 G ph f h g h d t t
ral f th g t oc m in scl al r yn g d ys ft
p m y t f th i c m f m t
g l d f y d by m f m t

degeneration of the muscle should be emphasized and remembered. The shortening of chronaxie occurs about the same time as we have found a temporary rise in the rheobase in threshold and ratio for progressive current stimuli and three fold and ratio for galvanic tetanus to occur. The cause for these changes is as yet unknown (Fig 5).

Following this there is a progressive lengthening of chronaxie to a peak which is reached at the 49th 49th 53rd 53rd and 60th days with a chronaxie of 56 milliseconds 23 milliseconds 60 milliseconds 72 milliseconds and 38 milliseconds respectively.

Once the peak of the lengthened chronaxie had been reached and as the result of regeneration began and continued to shorten the shortening process was rapid and of a considerable order. The answer to the question as to whether such a rapid and significant shortening of chronaxie occurred before signs of recovery of motion had occurred or earlier than signs detected by other methods of electrical examination was made possible by delayed recovery in one of the cats. The delay was found to be due to a large neuroma when the operation site was explored because motor function had not occurred at the expected time.

In this case the chronaxie had lengthened to 34 milliseconds on the 10th day after primary suture. On the 17th day it was 35 milliseconds and then it shortened to 20 milliseconds on the 27th day. On the 37th day it had again lengthened to 35 milliseconds and continued between 31 and 37 milliseconds to the 72nd day. On the 93rd day it shortened to 20 milliseconds and on the 108th day only was there a sharp shortening to 56 milliseconds.

seconds. Even if the lesser degree of shortening of the chronaxie at the 93d day be taken as an indication of recovery, it can be seen from Figure 5 that at the 60th day the large galvanic tetanus ratio predicted recovery which was confirmed by return of active motion on the 208th day. Thus the large increase of galvanic tetanus ratio predicting recovery preceded the lesser degree of shortening of the chronaxie by 33 days and the significant shortening by 48 days (Fig. 5).

In man we have also found that the increase of threshold for galvanic tetanus and of tetanus ratio as well as the increase of threshold for progressive current and progressive current ratio indicating successful regeneration of a nerve preceded the significant shortening of chronaxie indicative of recovery.

We have already called attention to the fact that discontinuities in the strength duration curves which are indicative of regeneration of a nerve may be seen during the time that chronaxie may continue to lengthen and seem to give indication of continuation of the degeneration of the muscle. In a group of spontaneously recovering peripheral nerve injuries in man the number of instances in which the chronaxie had significantly shortened (15 milliseconds or less) was about the same as those in which the galvanic tetanus ratio was high. However at times the galvanic tetanus ratio was low and the chronaxie short. At other times the chronaxie was long and the galvanic tetanus ratio high. When evidence of some denervated muscle was obtained by a low galvanic tetanus ratio and in the same muscle evidence of some neurotized muscle was shown by a short chronaxie the combination gave excellent indication of a spontaneously recovering nerve.

When however a nerve had been operated upon a considerable time before electrical examination was made whether motion or sensation had recovered or not the number of instances of high galvanic tetanus ratio exceeded those in which chronaxie had shortened. Nevertheless in some a low galvanic tetanus ratio and a short chronaxie indicated recovery.

It is obvious therefore that it is of value to measure the chronaxie as well as the galvanic tetanus ratio.

SUMMARY

The marked lengthening of chronaxie from that of a fraction of a millisecond in normal muscle to one of 100 or more times is indicative of a denervated muscle. After the initial marked lengthening

of chronaxie following section and return of a nerve the temporary shortening of chronaxie which occurs at about the 26th day must be interpreted as a sign of recovery. It is a phenomenon which occurs at a time when other changes in characteristics of responses to electrical stimuli usually seen at recovery also appear for a short time. These are the increase in rheobase, normal threshold for galvanic tetanus and of tetanus ratio, increase of threshold for progressive current stimuli and progressive current ratio. The cause of this is unknown. When one then follows the evolution of changes in chronaxie it is found that a significant shortening of chronaxie is associated with recovery. However when recovery is delayed this occurs much later than other indications of recovery derived from other methods of electrodiagnosis. Even when not delayed when regeneration of a nerve is progressing other signs precede shortening of chronaxie as an indication of recovery. However the combination of a low galvanic tetanus ratio with a short chronaxie is a characteristic of spontaneously recovering lesions and at times of recovery after operations on injured nerves.

CONCLUSIONS

1. The marked lengthening of chronaxie from that of a fraction of a millisecond to that 100 or more times longer is a clear indication of denervated muscle.

2. The temporary shortening of chronaxie during the course of degeneration of muscle is not a sign of recovery.

3. Significantly great shortening of chronaxie from its final peak of great length is a sign of recovery.

4. This sign of recovery occurs later than signs derived from other electrical examinations such as tetanus ratio and may not occur until motion of recovery is present.

5. The combination of a low galvanic tetanus ratio with a short chronaxie is characteristic of spontaneously recovering lesions and at times of recovery after operations upon injured nerves.

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EXPERIMENTAL CHOLECYSTITIS

Final Results of Vaccine and Filtrate Therapy

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In a tabular review of the literature on cholecystitis (2) the bacterial studies on 2162 diseased gall bladders removed at operation seemed to indicate that the organisms most frequently present were streptococci similar to those infecting the nose, throat, teeth, and bowel, the *Staphylococcus aureus* as in sinus disease, and members of the typhoid colon group. Our experiments conducted over a 15 year period were carried out with over one hundred antigens obtained from patients in the Jefferson Hospital. In the first series in which 16 strains of different types of organisms were injected into 88 rabbits, some degree of chronic cholecystitis was produced with organisms from each group, the most effective being a nonhemolytic streptococcus isolated from the bowel of a patient suffering from chronic cholecystitis and colitis. Inoculation of 66 of the 88 rabbits with the nonhemolytic streptococcus caused gall bladder disease in 13 (20 per cent). In a later communication (1) on the use of various bacterial organisms it is reported that 44 strains of 7 different types of organisms were used in 129 rabbits, resulting in 25 diseased gall bladders (approximately 20 per cent).

Ascending doses were injected intravenously into the rabbits' ears, usually beginning with 0.02 cubic centimeter of 6 hour culture, and repeated in larger doses once or twice a week, dependent upon signs of morbidity in the animal. Frequently injections were discontinued after the third or fourth small dose, but in other cases the dose amounted to 3 cubic centimeters of a 24 hour culture. Realizing that in some cases we had used too large amounts of the antigen, which tended to produce acute rather than chronic cholecystitis, we decided to modify the technique.

While aware of the virtual impossibility of duplicating in the experimental animal focal infection as it may exist in man, nevertheless we hoped to simulate this condition as closely as possible. Therefore small intravenous injections of 0.02 to 0.05 cubic centimeter of an 18 to 24 hour culture were repeated twice a week, unless contraindicated by the condition of the rabbit (1). One

hundred sixty six animals were injected with the viable strain of *Streptococcus nonhemolyticus* (antigen 7) until presumably chronic illness was clinically evident. Eighty four diseased gall bladders (51 per cent) were obtained.

The animals were then segregated into groups of 3 individuals: control, vaccine treated, and filtrate treated, the selections being based on similarity of response to the culture inoculation—the temperature and weight changes and presence of joint disease. (With the nonhemolytic streptococcus we have observed a high incidence of joint disease associated with gall bladder lesions.) When it was impossible to select 3 animals with similar manifestations, those in the poorest condition were placed in the control group. On this basis 59 were retained as controls, 50 were inoculated with vaccine, and 57 were treated with filtrate.

These series were further subdivided according to the nature of the dietary regimen (adequate in some cases and inadequate in others), and the results obtained led us to believe that the animals on an inadequate diet responded less favorably to treatment than did those which were adequately fed. Furthermore, the treatment with autogenous vaccine apparently yielded more satisfactory results than did treatment with the filtrate.

Since then we have employed the same method of experimentation on a further series of 224 animals, with this exception: After completion of the infective phase, the animals were arbitrarily selected for grouping as follows—*trial 1*: the rabbit apparently in the best physical condition was placed among the controls, and that in the poorest among the vaccine treated; *trial 2*: the poorest animal was placed among the controls, and the best in the vaccine treated; *trial 3*: the healthiest animal was selected for the filtrate treated group, the poorest for the controls. Employing this procedure for each selection of 3, the best and poorest animals were evenly distributed throughout the 3 groups. In this way we felt we had avoided prejudice in the selection of animals for treatment.

We shall present here a detailed interpretation of the data obtained by gross studies at necropsy on the 224 animals (4 control, 75 vaccine treated, and 75 filtrate treated) that lived, maintained on an adequate diet throughout the planned term of

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TABLE I — GROSS PATHOLOGY ASSOCIATED WITH GALL BLADDER DISEASE

SERIES OF 24 ANIMALS				ANTIGEN	7
				Number	Percent
Gall bladder lesions gross	1	1			
Gall bladder diseased bil	3			68	3
Gall bladder diseased bil	36			34	4
Gall bladder diseased bil	67			99	
Gall bladder diseased bil	8			3	
Gall bladder diseased bil				94	
Gall bladder diseased bil				46	
Gall bladder diseased bil	9			63	

treatment. The 11 controls 6 were treated and 14 filtrate treated rabbits which either died or were killed to prevent postmortem change when death seemed imminent and were not included in this report because autopsy disclosed that they suffered for the most part from an acute bacterial infection. The fact that so few animals died after initiation of the treatment phase of the experiment is perhaps indicative of our success in selecting the chronic cases on the basis of clinical evidence.

Microscopic studies on this series will be reported later. Nine normal animals selected from the same stock showed no evidence of gross or microscopic change at necropsy.

Table I summarizes the gross pathology findings on the gall bladder observed at necropsy on the 4 animals. It is to be noted that approximately one third of those with cholecystic disease showed coexistent kidney and joint infection. Elsewhere we shall present the studies on associated lesions.

Table II gives general findings on bacteriological study of cultures recovered during necropsy.

Only 37 or 16.5 per cent of the animals had an active infection and in only 20 or 8.9 per cent was the viable *Streptococcus nonhemolyticus* present in the bile. At first glance it may be thought that the recovery of the organism from the joints closely parallels that from the bile. However, it must be borne in mind that only 13 rabbits 58 per cent disclosed some active infection of the joints on necropsy. The remaining 3 joint cultures were from rabbits having multiple joint infection. It is apparent therefore that in both gall bladder lesions and coexistent joint and kidney lesions the organs were frequently sterile.

FURTHER DATA ON CULTURE INJECTION — VIBRIANT ORGANISM — 24 ANIMALS

In the control group with adequate diet the average 74 animals. The total number of injections

TABLE II — POSITIVE CULTURE RECOVERY

Animal	Th	It	Es	ber	Per cent
Tal post	37				13
Bil cult	5				24
Jt cult	20				5
Kidney	6				7
Oth so	9				45

given was 1301, the average injections number 18. The period of injections covered a minimum of 3 days to a maximum of 8 months. The range of injections was 1 to 58.

In the vaccine treated group with adequate diet there were 75 animals with an average number of injections of 18. The total number of injections was 1357. The time range of injections in the series varied from 3 days to 7 months. The range of number of injections was 1 to 52.

In the filtrate treated group with adequate diet there were 5 animals with an average number of injections of 19. The total number of injections was 130. The time range of injections (with more than 1 was given) varied from 3 days to 9 months. The range of number of injections was 1 to 60.

DURATION OF CONTROL PERIOD

Of 74 animals 48 were controls for 3 months, 14 were controls from 2 to 2 months, 5 were control from 3 to 5 months, 7 were control for 9 months.

In only 28.9 per cent of the 224 animals injected with the viable antigen was the organism recovered from the bile. It is therefore apparent that some time after the period of administration recovery of the organism was relatively infrequent.

After preliminary injection of the viable organism and an appropriate rest period the second group was subjected to vaccine treatment as follows:

Vaccine Treatment

Adequate Diet. Planned Period — 224 animals. In the group of 35 rabbits receiving small doses 9 received 26 or 27 treatments, 10 received 17 to 25 treatments, 6 received 28 to 35 treatments. Twenty-three were treated over a period of 3 months, 9 were treated from 2 to 7 months. These 32 were treated 3 to 4 months. The number of killed organisms given was as follows: 19 received single doses of 30,000 or 135,000 killed organisms, 9 received single doses of 33,000 to 57,000 killed organisms, 3 received single doses of 120,000 or 125,000 killed organisms, 4 received single doses of 140,000 to 189,000 killed organisms. A general average of 100,000 organisms per treatment was given.

TABLE III—SUMMARY OF INCIDENCE OF CHOLCYSTITIS AND COEXISTENT LESIONS

[illegible]

In the group of 40 rabbits receiving 1 g/or ascend dosage 19 received either 26 or 27 doses, 7 received 14 to 17 doses, 6 received 3 to 25 doses, 6 received 28 or 29 doses, received 43 or 46 doses or a general average of 26 doses. Twenty-eight received treatment for 3 months, 8 received treatment for 2 to 23 months, 4 received treatment for 4 to 6 months. The number of killed organisms given was as follows: 18 received from 160 000 to 470 000 killed organisms, 0 received from 500 000 to 685 000 killed organisms, received 1 358 000 or 2 312 000 killed organisms or a general average of 56 000 killed organisms per dose.

The third group was submitted to the treatment as follows:

Felt at Texas 291
224 animals

In the group of 40 rabbits given all the ages 5 received 27 to 30 losses 13 received 25 to 6 doses 12 received 12 to 21 losses 1 to 10 received treatment for 3 months 10 received treatment for 1 to 21 months 4 received treatment for 3 months The amount of filtrate given was 3 received 15 ml 5 to 35 cc 1 to 10 ml 1 to 10

11 received 0.60 to 1.05 cubic centimeters 6 received 1.40 or 1.45 cubic centimeters

If the group of 35 rabbits given large *o. ascend* do ges 19 received 26 or 27 treatments 12 received 14 to 25 treatments 4 received 28 or 29 treatments and 1 received 43 treatments Twenty six received treatment for 3 months 8 received treatment for 2 to 2 1/2 months 1 received treatment for 5 months The amount of filtrate given was as follows 14 received from 2.75 to 3.90 cubic centimeters 13 received from 4.05 to 4.85 cubic centimeters 7 received from 5.30 to 5.65 cubic centimeters and 1 received 14.46 cubic centimeters

TABLE IV.—GRADES OF GROSS GALL BLADDER LESIONS OBSERVED

G	C	V	F
N	3	7	29
Vin-m us	3	3	29
Flos	29	7	29
Fl			

TABLE 1.—INCIDENCE OF CHOLECYSTITIS WITH COEXISTENT LESIONS

[illegible]

To ascertain the effect of treatment upon the pathological picture the data used to prepare Table I were appropriately distributed among the respective groups of 4 control, 75 vaccine treated and 75 filtrate treated animals (Table III).

Necropsy of many hundred of healthy rabbits killed to obtain material for physiological and chemical studies has given us an indelible picture of the healthy gall bladder in the rabbit. Likewise our experience with the experimental production of cholecystitis has taught us how to recognize grossly an unmistakably pathologic gall bladder. However on many occasions during these experiments necropsy revealed gall bladders that were not definitely pathologic yet on the basis of our experience with normal gall bladders we were not justified in considering them negative. There were deviations from the normal but the changes were too slight to characterize the organs as definitely diseased. In such cases we decided to record the observations as plus-minus that is the condition was intermediate between the normal and that clearly having low grade pathology. Study of Table III discloses that the questionable or plus-minus gall bladders furnish the crucial data when we seek to determine the efficacy of treatment in reducing the incidence of cholecystitis.

tus. If we consider the plus minus les as belonging to the positive group then the incidence of disease among the controls is 69 per cent in the vaccine treated animals 64 per cent and in the filtrate treated 2 per cent. These differences in frequency are too small to be of any ortho's significance. On the other hand if the plus-minus gall bladder lesions are not considered then the occurrence of definitely positive gall bladder lesions in the control group is 65 per cent while for the autogenous vaccine treated group it is 44 per cent and for the filtrate treated group 64 per cent.

Vaccine treatment therefore presumably lowered the incidence of gall bladder disease by 21 per cent.

In regard to this difference it is interesting to note that 20 per cent of the vaccine treated animals exhibited doubtful or plus minus gall bladder disease while only 4 per cent of the controls and 8 per cent of the filtrate treated animals had plus-minus gall bladder lesions. It is a question whether the observation of doubtful changes at the termination of treatment signifies that these lesions were in a state of involution or that a very low grade infection was present throughout the period of experimentation. In view of the low percentage of doubtful gall bladder lesions among

TABLE VI—RELATION OF GRADE OF GALL-BLADDER LESION TO METHODS OF TREATMENT

Grade of lesion	Vaccine				Filtrate			
	Repeated small doses 3 animals		Ascending doses animal		Repeated small doses animal		Ascending doses 3 animals	
	N	%	N	%	N	%	N	%
Negative		3	5	3.5	5		3	3
Plus-1	7		6		4			5.7
Plus	8		5		37		7	20
Pl	6		20		3			3.4
Plus 3			5		5			5.7
Total definite			45				20	57
Total of 115 animals	3		6		80		6	

the controls we feel that the evidence points more strongly to the assumption that these were in process of involution.

Failure with the filtrate treatment may be ascribed either to inadequate dosage or to inability of the viable organism to elaborate a potent exotoxin.

Table IV is a frequency distribution of the various grades of gall bladder disease observed in the 3 groups (control vaccine treated and filtrate treated animals).

Comparison of the control and vaccine treated groups discloses (1) that there were 5 per cent more negative gall bladders in the vaccine group (2) there were 12.4 per cent fewer mildly positive (plus 1) gall bladder lesions in the vaccine group (3) there were 5.6 per cent fewer moderately severe (plus 2) gall bladder lesions in the vaccine group. The incidence of severe (plus 3) gall bladder lesions were too few to lend themselves readily to interpretation. Yet if one adds the 5 per cent difference in the incidence of negative gall bladders in the control and vaccine groups to the 16 per cent difference in the doubtful lesions for the control and vaccine groups the resulting sum equals the sum of the respective differences in plus 1 plus 2 and plus 3 lesions of the control and vaccine treated gall bladders e.g. in the negative group there was a difference in percentages of control and vaccine of 5 per cent in the plus-minus group of 16 per cent or a total of these groups of 21 per cent. In the plus 1 group the difference was 12.4 per cent in the plus 2 group the difference was 5.6 per cent in the plus 3 group the difference was 2.7 per cent or a total of 20.7 per cent in the latter 3 groups.

Repeated small doses and ascending doses were employed in order to evaluate the merits of the two methods of treatment. The data obtained with the respective groups after the small and

the ascending doses were used are presented in Table V. Here again evaluation of the improvement in the gall bladder lesion depends upon what significance is to be placed upon the doubtful lesions.

The frequency of the respective grades of gall bladder lesion in relation to the mode of dosage with vaccine or filtrate is presented in Table VI an extension of Table IV.

The total positive culture recovery of the control vaccine treated and filtrate treated groups is given in Table VII.

In Table VIII the incidence of various grades of gross gall bladder lesions observed at necropsy is compared with the number of injections of viable antigen 7 (*Streptococcus nonhemolyticus*) given during the infective phase of the experiment.

The question may be raised as to whether the number of injections (amount of viable culture) given eventually determines the degree of gall bladder lesion produced. To ascertain accurately the effect of a number of injections an equal num-

TABLE VII—TOTAL POSITIVE CULTURE RECOVERY

Source	Control group		Vaccine group		Filtrate group	
	N	%	N	%	N	%
Animals with positive culture	5	20	8		4	5.7
Gall bladder wall bil	1	5	6	7	2	?
Bil	6					
Pl	8		7			
Liver						
Kidney						
Uterus						
Cystic material						
Total positive culture						

TABLE VIII — FREQUENCY OF VARIOUS GRADES
OF GROSS GALL BLADDER LESIONS
NUMBER OF INJECTIONS OF VIABLE ANTIGEN

No. of animals	Frequency of lesions				
	Negative	Plus 1	Plus 2	Plus 3	Plus 4
10	8			2	
3	3	3			
60	8				
3			4		
			4		
60					

Ad lib. normal animal. b. b. ill bladder. a. g. normal bac.

ber of animals should have been used for each range of injections which unfortunately was not done. Table VIII shows for example that only 8 rabbits received injections in the range of 51 to 60 while 91 rabbits received injections in the range from 1 to 10. Since the average number of injections of culture given in our experiment was 18 for each group it is not surprising that 146 (65 per cent) of the animals received injections in the 1 to 10 range. However severe (plus 3) lesions were not found in any group when more than 30 injections of the viable antigen were given.

The average life expectancy for a rabbit is about 6 years (312 weeks). The period of inoculation with antigen 7 averaged 10 weeks or 1/30 (10/30) of a rabbit's life. With 60 years as the life expectancy of man then by direct comparison the human being would have been subject to an active infection for 3 years. Most of the rabbits received vaccine or filtrate for 3 months or 1/6 (1/3) of their lives. For the human subject this period of treatment would be comparable to 3 years.

CONCLUSIONS

1. A final survey is presented of experimental cholecystitis produced in rabbits by the intra-

venous injection of a viable strain of *Streptococcus* originally obtained from a rabbit suffering from cholecystitis and colitis.

2. After an initial period of inoculation with the viable organism and a subsequent rest period the animals were divided into 3 groups of 10 each. The first group received the second test of vaccine and the third with a filtrate prepared from the same organism.

3. By the use of a modified technique the incidence of cholecystitis was increased in this series to 68 per cent.

4. The gross findings at necropsy were classified as (a) doubtful (b) plus 1 (c) plus 2 and (d) plus 3.

5. Any difference observable was in favor of the animals who received vaccine treatment. Of the control group 64 per cent were definitely positive and 4 per cent doubtful of the vaccine group 44 per cent were positive and 16 per cent doubtful and of the filtrate group 64 per cent were positive and 8 per cent doubtful. The observation of doubtful lesions at the termination of a treatment may signify a state of involution or persistence of a low grade infection. In view of the small percentage of doubtful gall bladder lesions among the controls we feel that the evidence favors the assumption that the doubtful lesions were undergoing involution. The total positive culture recovery was a somewhat low number.

6. On the other hand in a general survey the evidence of gall bladder damage was markedly constant in all three groups attesting to the fact that the viable organism was responsible for the changes. No evidence of gross or microscopic change was found in 9 normal rabbits selected from stock.

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EDITORIALS

SURGERY Gynecology and Obstetrics

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1905-1935

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D A L E C B A L O U R 1 1 E d i t o r a t S t J

OCTOBER 1945

MISUSE OF MORPHINE AS A THERAPEUTIC AGENT

IN anybody's list of the drugs that are most useful in medicine morphine would be placed near the top. Misuse of the agent that may have occurred in military medicine only points to a similar although perhaps less noticeable abuse in private practice for military medicine during wartime represents a cross section of civilian medicine. Both pharmacologists and clinicians say that the misuse of morphine is not to be placed at their respective doors. Where the responsibility lies for the unwise employment of this agent is less important than the fact. It is to be recognized too that here is one more example of the regrettable state into which the teaching of therapeutics has fallen. The situation is a paradoxical one in that medical school and hospital whose aim is to provide a background which will permit the student to understand the treatment of disease often fail to accomplish this reasonable end. At least they fail have failed in the present in-

stance to ensure the sensible use of this most important agent.

Aside from the fact that adequate teaching of therapeutics does not exist in many medical centers the causes of morphine overdosage (for its misuse is chiefly that) are several.

There is failure to appreciate that nearly the safe maximum analgetic effect of morphine can be produced by 15 milligrams (gr $\frac{3}{4}$) and that 30 milligrams (gr $\frac{1}{2}$) can produce serious depression in small individuals or in any individuals whose tolerance may have been lessened by wounds particularly those associated with hemorrhage or pneumothorax or other disability that limits the intake and distribution of oxygen. In civil life everybody practically knows that morphine is contraindicated in hypothyroidism and is dangerous in obstetrics. Too few know that impaired liver function increases the danger that an otherwise modest dose may become an overdose in a given case.

Failure to realize that subcutaneous injections of morphine will be only poorly absorbed if at all when the peripheral circulation is sluggish or inactive as a result of cold or low systemic blood pressure has led to rather frequent trouble. Failure to get pain relief from the unabsorbed morphine leads to the administration of a second or third dose all of which may be absorbed at one time when the peripheral circulation is re-established as a result of resuscitative measures.

The incorrect belief that extensive wounds are inevitably associated with severe pain often leads to needless use of morphine. At Anzio only a quarter of the severely wounded patients said in response to a direct question

that they were having enough pain to want pain relief medication. This was in one of the most forward hospitals and these patients had not had morphine for seven hours on the average.

The administration of morphine for conditions that will not respond satisfactorily to the agent, however large the dose, is a common error. Specifically, the use of morphine to treat the restlessness associated with bleeding with anoxia or with hysteria cannot be soundly defended. The use of morphine in shock, except for the treatment of severe pain, is contraindicated; it produces sweating, it causes nausea and vomiting. Thus it not only increases fluid loss but makes the intake of fluids by mouth and their retention often impossible.

Morphine is occasionally administered where other agents (barbiturate sedation, for example) are far better, as in the treatment of nervousness, the jitters, sleeplessness. Individuals with these problems are of course likely candidates for addiction. The use of morphine as a routine in preanesthetic medication is difficult to justify, for there is reason to believe that the patient pays too high a price for the depression obtained by means of this agent, and that the effect desired could be achieved better in other ways.

The evidence is mounting that morphine has a single legitimate use, the relief of severe pain—a widely accepted view, but one too little put into practice.

HENRY K. BEECHER

Consultant Anesthetist and Resectant
Medicine Thoracic Surgery

THE SURGEON'S LIBRARY

REVIEWS OF NEW BOOKS

AS in previous years *The 1944 Year Book of Radiology* first attracts attention during the period from about the middle of the current year (1943) to the middle of the current year (1944). The value of such a volume is great regardless of whether it is read by the busy physician with little effort or by the student with the time and energy for a more detailed study. By combining the two, the pages of this book are a great help to the busy physician with little effort and to the student with the time and energy for a more detailed study.

Both interpretations and attempts in collecting the material the editors have covered the publication of the world's best acting 435 leading articles from the United States and 12 foreign countries.

The volume of 450 pages with 363 excellent illustrations at a price of \$1.00 and bound in a comprehensive index is well appreciated.

The practical questions of 20 questions listed on the jacket of this volume are well summarized.

Dr. W. T. R. has followed the excellent plan of classifying the articles and diagnosing body systems. The articles abstracted will be of value and adequate to the reader. Dr. Kaplan has provided the field of ad therapeutics an introduction of 40 pages followed by his usual excellent abstracts of the latest articles. Physicians who on previous volumes look forward to this publication and will make certain that their collection is complete. To the not familiar with the cell book it is recommended without reservation as a valuable addition to our medical library. C. L. E. BARTH.

The volume entitled *The Gastrointestinal Tract* by Fred J. N. Hodges is one of a series of handbooks of the diagnosis being published by the Year Book Publishers. The author has drawn from his wide experience with the field of the University of Michigan Medical School and has a deep administrative background in the field of gastrointestinal radiology.

The subject matter is divided into six sections: the esophagus, the upper gastrointestinal tract, the lower gastrointestinal tract, the biliary system, the pancreas, and the small intestine. The importance of the field of the gastrointestinal tract is emphasized by the author. The book is a valuable addition to the medical library.

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The arrangement of placing the descriptive and legible on the left hand page and the illustration on the opposite side facilitates study. The illustrations are numerous, well chosen, and are grouped in such a manner that the serial illustrations on roentgenograms of the same patient appear side by side. All of the 604 illustrations are in the negative phase and excellently reproduced. A short bibliography appears at the end of each section and an adequate index is appended.

The author and publishers have succeeded admirably in the production of an excellent handbook. It is a concise, surprisingly compact, and its size and can be highly recommended to students, roentgenologists, gastroenterologists, and to any physician interested in the diagnosis of the diseases of the gastrointestinal tract. E. W. E. BARTH.

THE very excellent book *The Art of Resuscitation* by Paul J. Flagg treats in a most complete fashion the subject of resuscitation. The two volumes are written by Chas. J. Jackson. The beginning chapters list the growth of the art of resuscitation from the history of tracheotomy and intubation through the efforts of organizing a society for the prevention of asphyxial death to its present status. Asphyxia is next treated as a general problem. The physiological principles involved are accurately and well defined. The principles of resuscitation are set forth with clarity and simplicity with the correct stress on indication for treatment and types of treatment. The methods of resuscitation are merited with emphasis on intratracheal insufflation.

A chapter is devoted to the transportation of the unconscious patient. The author describes in detail the reconstruction of a commercial ambulance to take care of the unconscious patient prior to the onset of unconsciousness and intravenous infusion. The necessary details of the book to a careful thorough discussion of asphyxia as a specific problem in the newborn from high altitudes from carbon monoxide poisoning from submergence in water, neonatal asphyxia, and intracranial hemorrhage. The ratio from the pathologic observations of respiration and from clinical data. Each part of the book is amply illustrated and unfolded with the expert touch of a man with Dr. Flagg's vision and experience could hardly do.

In the section on the committee of asphyxia of the American Medical Association numerates the

The author's name is Paul J. Flagg, M.D., and the publisher is the Year Book Publishers.

1. In which immediate attention is needed. A method is outlined of attacking the problem by publication of research and a step-by-step instruction of physicians. Emphasis is made on the role of the United States Public Health Service in first aid to the important phases of a physical examination. A method of discussion of common arterial diseases and its relation to asphyxiation is treated. The physical diagnosis of the patient is discussed. Other subjects covered with thoroughness include physical diagnosis of the patient and the patient's economic condition of the patient. The patient's physical condition is discussed.

The purpose of this book is an entirely practical one. It is a textbook based upon more than 50 years of experience with the author's own patients. It tells the reader what to do when faced by a patient with a physical condition. The book is a complete treatise on the subject of the physical examination of the patient with a physical condition. It is a book which will fill the much needed place in the library of the physician. M. V. KARP

In the present day and age, the medical profession is faced with the problem of the physical examination of the patient.

the disease of the shoulder. The monograph is a detailed description of the disease of the shoulder. The author is a specialist in the field of the shoulder.

The book is a detailed description of the disease of the shoulder. The author is a specialist in the field of the shoulder. The book is a detailed description of the disease of the shoulder. The author is a specialist in the field of the shoulder.

The disease of the shoulder is a common condition. The author is a specialist in the field of the shoulder. The book is a detailed description of the disease of the shoulder.

On the whole, the book by Dr. McLaughlin is a very good one. The author is a specialist in the field of the shoulder. The book is a detailed description of the disease of the shoulder.

WILL M. A. L. M.

FRCS (E) L. B. H. F. Model. M. A. D. M. M. Ch. (Ox.)

CORRESPONDENCE

DICUMAROL THERAPY IN POSTOPERATIVE THROMBOPHLEBITIS AND PHLEBOTHROMBOSIS—

A Correction

OPPORTUNITY has been given me by the Editors of SURGERY GYNECOLOGY AND OBSTETRICS to correct some of the mistakes in my article.

my article entitled "Dicumarol Therapy in Postoperative Thrombophlebitis and Phlebotomy" which appeared in the July 1951 issue. These mistakes began on page 8.

The policy to use 3 seconds as a basis for standardizing the procedure for the drug is a very good one. The author is a specialist in the field of the shoulder.

October, 1945

International Abstract of Surgery

*Supplementary to
Surgery, Gynecology and Obstetrics*

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A t p y spc m n

Neck
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Hyst ect my 3
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OBSTETRICS

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 F J i t D f c s P g cy
 QUIGLEY J K H h t al Abou
 SCOTT W A S m c I C mplicat D n g P s
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 H A S S d k TSCHE H L Pyel us f
 P gna cy

L b and It C mplicat i s

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 Ob r y t B h D l G t
 Hospital

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GENITOURINARY SURGERY

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 th H j l m Ope t

Genital Org

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 M G B Id path c G ren fth Sc t m
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 J A Ope t f U d se d d T t l

Mi c Haneo s

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 3 3 H J H BOTSFOED T W d Tr CHEL
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SURGERY OF THE BONES JOINTS MUSCLES
TENDONS

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Orthopedi s in G e l

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SURGERY OF BLOOD AND LYMPH SYSTEMS

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 3 8 HODG G B G m K S d Sc NE L H M
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Blood Tra f s u

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 3 9 D Go v E L Th Pos bl R l f Wh l Blood
 Tra fus M l l ry Med c
 3 3 TRALHUNE W T to E S and SH UP T S
 Th Tra sf I C t d g d l m Type f
 O C H Res pended d St red i pe ce t
 C m Syrup
 3 3 MCUTIE R O C t t l R d Bl d C l l
 Prep t and Use

McDO ALD J. R. HARRINGTON S. W. dCLA ETY
O T Hamart m (Ofte Called Ch drum)
of th Lung

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Adenoma Treated by Pulm ry Resect

SEYBOLD W. D. and CLA ETY O T Ca dr ascu
Disturban es ill wi g P um ect my

RESE A. Th Importan f Examin t f th
Sputum E al t g P re chymal infiltr

Heart and Pericardium

RO INS S. L. B ain Abscess Associated th C
g nital Heart D ease

BLALOCK A. d TACS g H B S r gical T t
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Esophagus and Mediastinum

HARPER R. A. K. and TICZ CO E Benign Tum
f th Esoph gu d ts Diff tual Diagn is

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INTERNATIONAL ABSTRACT OF SURGERY

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THE RELATIONSHIP OF CHRONIC LESIONS TO CARCINOMA OF THE COLON—CHRONIC ULCERATIVE COLITIS

Collective Review

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DURING the past decade the results of surgical management of carcinoma of the large bowel have improved dramatically and the application of technical advances has greatly reduced the hazards which too often followed resections of the colon. Now that malignant lesions of the colon in expert hands can be treated in such a manner as to offer a more favorable prognosis to the patient it is our duty to improve the clinical results further through efforts directed at earlier recognition of the cancer. As a step toward this objective we may learn some facts from a careful analysis of our knowledge regarding those diseases of the colon that may have a prefatory relationship to colonic cancer, one being chronic ulcerative colitis.

In order that the extent of this review may be kept within bound the literature of the last ten years only has been surveyed; references to earlier studies have been made only when necessary and when the reason for their citation is evident.

At the outset it may be stated that although a number of reviews have appeared (7, 8, 11, 14, 16, 19, 21, 30, 39, 61) during the past decade our knowledge in this field has not been greatly extended either by the addition of new material or by significant fundamental discoveries.

A review of the recent literature on chronic ulcerative colitis demonstrates the controversial status of all aspects of the subject. In 1939 Willard (62) wrote of chronic ulcerative colitis.

If the two recognized entities, tuberculous colitis and amebiasis, be omitted from discussion there is no agreement as to classification, etiology, natural history, prognosis or treatment of this symptom complex. Six years later in 1945 Willard's statement is certainly just as valid as it

was when first made. There are a number of theories regarding the cause of this disease and the authors are proponents of the several ideas these have been summarized in Table I.

The data assembled in this table present convincing evidence of the meagerness of our knowledge regarding the exact etiology of chronic ulcerative colitis. Notwithstanding the fact that even during recent years many students have carried on extensive investigations of the problem there is still no unanimity of opinion. Possibly this is true because in the past all of the chronic ulcerative diseases of the large bowel, except those due to tuberculosis, amebiasis and carcinoma, have been grouped comprehensively together under the term chronic ulcerative colitis. However the present tendency is in the opposite direction and as a result of more experience there is an inclination to define the disease entities within the composite group more precisely. Thus in 1941 Bargen (7) pointed out that chronic ulcerative colitis as it is known today is probably a syndrome consisting of numerous disease entities. Apparently the resolution of this phase of the general problem is still progressing in the same direction. Because more recently in 1944 Bargen (8) states:

There are many varieties of ulcerative enterocolitis. One cannot emphasize too strongly the importance of establishing as nearly as possible the nature and cause of a given case. He now recognizes the following seven disease conditions that are characterized by varying degrees and types of chronic ulceration of the colon:

1. Streptococcal ulcerative colitis (also referred to as non-specific or idiopathic ulcerative colitis and sometimes as colitis gravis and thrombo-ulcerative colitis.)

TABLE I.—THEORIES ON THE ETIOLOGY OF CHRONIC ULCERATIVE COLITIS

General Type i.e.logy	Particular Cause or Age Fac	Authors Proposed
All gen	Food and drugs	Andresen 33
Endoc	Endocrine imbalance	Pitts 5 K. pel wt 5 Reed, 3
Infect (?)	Fungal occurrence	Jackman d B. ge
Infect	Dysplasia or coccyx	B. ge d. Graham 3 Fed
	Streptococcus	Carrington 3 Ch. pra d Ra 3 ge 44
	Bacillus aerobius	D. k. al. D. ag. ed 1
	Bacillus dysenteriae	Harris H. rs F 6 T. ra 6 W. k. ls F. lse
	E. coli bacilli	F. d. k. 37 W. k. l. m. 3
	Virus	Gallart d. D. gung
	Secondary fec	P. n. l. 38 W. k. ls d. Sh. t. man Bock
Muscul	Muscle spasm	L. um. 3 L. um. d. F
Nerv	Psychogenic	Marr Rechad, 36 Sullivan 6 W. kow 8 Red 3 D. m. l
Neural	Intestinal cat. m. d. G. cy	K. pel wt. 3
Terminal Sts	Spasmodic	K. 6 Dyneck
	Mucous	Evans

- 2 Amebic ulcerative colitis
- 3 Ulcerative colitis due to the virus of venereal lymphogranuloma
- 4 Regional ulcerative colitis (cause not clear)
- 5 Regional ileitis
- 6 Tuberculous ileocolitis
- 7 Other intestinal conditions
 - (a) Chronic bacillary dysentery
 - (b) Ulcerative colitis of unknown cause
 - (c) A deficiency syndrome
 - (d) Allergic colitis

In the study of the relationship of this syndrome to carcinoma of the colon information regarding the etiology of chronic ulcerative colitis has a double interest. First of all since most previous reports in the literature have not clearly differentiated particular disease entities and since a number of etiological agents and factors appear to be involved it is unlikely that from an analysis of recorded data we should discover a kinship of cause for the carcinoma and for the pre-existing ulcerative state. In the second place if carcinoma is an important complication of chronic ulceration in the colon the existing data can scarcely be expected to establish more than a sequential relationship of the carcinoma to the prefratory chronic ulceration. Pertinent observations in the literature have been assembled in Table II.

In 1917 Yeomans (67) reported the development of a rectal carcinoma in a woman with chronic ulcerative colitis and from whose bowel he had previously removed several benign adenomas.

This case was 1 of 7 that Yeomans presented

to demonstrate his concept of the precancerous nature of adenomatous tumors of the colon. He stated: "Both clinically and by histological study of the specimens the transition from simple inflammatory hyperplasia to tumors pathologically cancerous can be traced through stages of inflammation, gland cell hypertrophy and hyperplasia and adenoma to definite adenocarcinoma." It is a logical inference that continuance of the irritative factors that induce the adenomas stimulate epithelial hyperplasia until it breaks through normal bound and becomes malignant. A year later in 1928 Bargen (4) reached the same conclusion and wrote: "In view of the various reports in the literature, the frequency with which polyposis has occurred in the series of cases of chronic ulcerative colitis at the Mayo Clinic and the simultaneous occurrence of polyp and carcinoma in the diseased colon the following hypothesis is offered: the sequence of events in some cases of malignant disease of the colon is chronic ulcerative colitis, multiple polyposis and malignant disease." Since then Bargen and Comfort (9), Burst and Bargen (15), Bar en and Dixon (10), Bargen, Jackman and Kerr (11), Streicker (56), Matzner and Schaefer (44), Rankin (51), Jackman, Bargen and Helmholtz (37), Sauer and Bargen (55), Cattell (17) and others have subscribed to this thesis as it was originally stated by Yeomans and later by Bargen.

The observations and conclusions of other authors however have supported an opposing view. In 1934 Ewing (26) stated: "It is somewhat

remarkable that carcinoma very rarely develops in chronic ulcerative proctitis or colitis. In 1939 Swinton and Warren (59) basing their conclusions upon extensive material wrote "It is possible in our series to demonstrate histologically all stages in the sequence of change from normal colonic mucosa to actual adenocarcinoma."

From a microscopic study of a large series of intestines from patients with chronic ulcerative colitis both specimens removed surgically at varying lengths of time after onset of the disease and specimens obtained at autopsy we believe that chronic ulcerative colitis is not a factor predisposing to the development of polyps.

In our patients with ulcerative colitis we have observed another interesting fact. Following healing of the acute ulcerative process we have known these pseudopolypoid tumors to regress and disappear. We have never observed the regression or disappearance of true polyps of the large bowel except in rare instances in which the polyp has broken away from its pedicle. This of course also definitely suggests that the pseudopolypoid tumors resulting from known irritation and infection have different fundamental growth characteristics than the discrete and multiple polyps which are not the result of known infectious processes.

We have never observed the polypoid changes seen in ulcerative colitis progress to a malignant stage. Moreover Hurst (34) in 1935 Willard with his associates in 1938 (63) and Feder (27) in 1939 have reported on series of cases comprising respectively 40, 66 and 88 patients with chronic ulcerative colitis with no carcinomatous change.

With the foregoing general summary of the conflicting opinions the data arranged in Table II may be analyzed.

During the last twenty years and apparently because of the continuing interest of Bagen, numerous papers on this subject have appeared in which the accumulating material from the Mayo Clinic has been utilized. Bagen's name is associated with the majority of these reports. An attempt has been made in Tables II and III to congregate the findings recorded in these papers and in order to extract the data essential to this study the successive reports have been compared. It is unfortunate that individual reports were not regularly included so that the cases could be accurately identified.

The data presented in Table II may be rearranged and summarized in three categories:

1. The literature contains the reports of 3 individual cases of chronic ulcerative colitis in which carcinoma of the colon developed as a complication. Of these 33 cases 4 were reported as

isolated cases and 29 were reported as individual cases belonging to groups of cases with colitis.

2. Observations on the associated incidence of carcinoma of the colon and chronic ulcerative colitis have been recorded in 7 series of cases and in each the percentage of cases with carcinoma has been calculated. When these groups are combined it appears that 28 patients among a total of 1,467 cases of chronic ulcerative colitis developed carcinoma. On the average therefore the incidence is 1.9 per cent and the percentage for each of the four series in which it could be calculated separately was 1.3, 1.6, 2.16 and 3 respectively. In 3 other series made up of 40, 66 and 88 cases respectively no case of carcinoma was observed. In 1940 Jackman, Bagen and Helmholtz (37) studied a group of 95 children in whom 6 carcinomas developed later in life; this was an incidence of 6.3 per cent among those who suffered from colitis as children. A summary of these records is presented in Table III.

3. In 1944 Cattell (17) and Sauer and Bagen (55) reported on groups of 11 and 26 cases respectively in which carcinoma of the colon developed as a complication of chronic ulcerative colitis in their papers which together report a total of 37 observations; no individual case records were included nor was there a record of the total number of patients with colitis among whom these cases of carcinoma appeared.

The matter of carcinomatous transformation of adenomatous polyps in the colon and particularly the relation of chronic ulcerative states to that problem and to an increased incidence of carcinoma are of practical and theoretical interest. From the clinical point of view the natural history of a disease must be charted before the value of therapeutic measures can be estimated. From the standpoint of cancer control it is essential that cognizance be taken of all predisposing influences. Furthermore the pure scientist has an interest in any evidence which may be garnered to demonstrate a relationship between chronic irritative processes and the malignant state.

General incidence. Critical analysis of the accumulating data appears to fortify the hypothesis enunciated by Leomans and by Bagen that there is an increased incidence of colonic carcinoma in chronic ulcerative colitis. Recently Cattell (17) wrote: "For a number of years our observation indicated that malignancy was a rare development on the basis of chronic ulcerative colitis. However in the last two years we have observed 8 patients with carcinoma arising in ulcerative colitis and previous to this period 3 additional patients had been seen. At present we believe

TABLE II—PUBLISHED REPORTS OF CARCINOMA OF THE COLON WHICH DEVELOPED IN PATIENTS HAVING CHRONIC ULCERATIVE COLITIS

[illegible]

TABLE II—PUBLISHED REPORTS OF CARCINOMA OF THE COLON WHICH DEVELOPED IN PATIENTS HAVING CHRONIC ULCERATIVE COLITIS—Continued

Serial Number	Yes if P Ca on	A ho	Se t	Ag P C h Recognized	D ra on f Col l ars t er to D m Car	mb e f Cases f Col l ed Repo ed	R po d I d ually	mb e f Cases f Car non F m l	Re por ed G o op	C a t f Cases w h Car room	Loc a on f the Car m
38	35	B rgen and D n (g)		6	6						Cecum
0	35	B ge I D (g)	F	5							Rec m
	6	Ch pu									Rec m
4	5	B gen, Jack m d K (h)				82			(5)	5	
	35	F f ()				83				—	
3	5	S k (j)				7			3	3	
		W l d f el (h)				66				—	
5	93	N d Schae f ()	M			()					Sigm d
6		M tan nd Scha f ()				95			3	6	
7		Jack ma R d H lm h f (m)				(5)			(6)	63	
8	44	C a t H ()									
9		S a I D							6		
		Total ()				6			()		

F l a o y V l e f o r T b l l l Th m e l l e d
p t h e s e s d e n t t h a t t h p u t i c l s i g n i f i c a n t
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() A l v i d l c a s e r e p o t l d e d B g p a p e
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m) t w s c l d e d l m t h p f 4 c a s e l i d
d e r S e n a l N t h u s c a s e i s t a b l t e d t o m p h a z e
f r t t i n c l n l y c a s e s f r o e d c a r e m
(d) A p p a t y a n a d d i t a n l c a s e r e p o d b y B r g
(5) u c e t h e p p e r l 19 8 3 (4)
(f) C a s e s r e p o r t e d f m t h N w L o d g C l
(f) C a s e t i n c l d e d g r p o f 4 r e p o r t e d f m t h
N e w L o d g C l i n i c a n d l i s t e d d S e n a l n o

(g) O l g p f 27 cases wh h g c ses f
ca can m d 2 l lymph sa cam (4) w re repo ted
l m the repo t th ca s l ymphosa c m cannot be
d tufed
(b) l th y rs 9 5 t 93 l 87 p tu ts
wth ch t ratu c lit's w t th Mf y
Chu S t bel ed that th 6 cas s r efr red t
(c) bo m y h bee l ded amo th 8 c o-
m th ltt figu h lld be red ed t d th pe
t g f m 3 t S d B ge (54) say 7
d it nal ca es ca d d t thus p pe
(f) F m b h l l l l p al B ooklyn N Y
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(k) F m th D p t n t l G t o e t l g y C d
t School f Med U ty fl yl anl Phi
lad lph a
(f) F m th Jew h Hosp tal l Brooklyn New Y k-
7 cases l polyspous
(m) l l d d w th es h w d Sen l N 4
(f) F m th Lab y Cl c
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t al of 6c

that malignancy while somewhat rare is most frequent in patients who have had ulcerative colitis for over five years. We have been following patients carefully for these last fifteen years and in those who have had symptoms for a long time an increasing incidence of carcinoma has been noted. This statement is especially important for since it is based upon further experience.

As has been pointed out the average incidence of carcinoma as calculated in the reported series of cases of chronic ulcerative colitis is 1.9 per cent. Statistically this figure would require the same

TABLE II.—PUBLISHED REPORTS OF CARCINOMA OF THE COLON WHICH DEVELOPED IN PATIENTS HAVING CHRONIC ULCERATIVE COLITIS

[illegible]

TABLE II—PUBLISHED REPORTS OF CARCINOMA OF THE COLON WHICH DEVELOPED IN PATIENTS HAVING CHRONIC ULCERATIVE COLITIS—Continued

Serial N. mbr	Year of Publication	Author	Sex	Age at Onset	Time from Onset to Death	Number of Cases Reported	Location of Carcinoma
33	35	Berge and Dur (g)		6	6		Cecum
39	935	Berge and Dur (g)	F	5			Rectum
	6	Chapuy					Rectum
	3	Berge and Jackman (h)				87	(f) 3
	35	Fed (i)				85	—
	935	Schick (j)				7	3
44		Willard (k)				66	—
5		Martin and Schaff (l)	M			(7)	Sigmoid
6	939	Martin and Schaff (l)				35	3 6
		Jackman, Berge and Willard (m)				(5)	(6) 63
8	44	Call (n)					
	44	Saunders (o)					6
		Talbot (p)				6 3	(1)

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thoses and cat that the p. r. la. fig. es w. t.
sed f. th. tal. It. lez. n. m. l. d. d. by
calculi f. m. pub. h. d. ta.

(c) Two cases of lymphosarcoma of the colon. The first case was reported by the author in 1935. The second case was reported by the author in 1944. Both cases were of the advanced type and the patients died within a short time of the onset of the disease.

(b) The first case was reported by the author in 1935. The second case was reported by the author in 1944. Both cases were of the advanced type and the patients died within a short time of the onset of the disease.

(c) A third case was reported by the author in 1944. This case was of the advanced type and the patient died within a short time of the onset of the disease.

(d) The fourth case was reported by the author in 1944. This case was of the advanced type and the patient died within a short time of the onset of the disease.

(e) The fifth case was reported by the author in 1944. This case was of the advanced type and the patient died within a short time of the onset of the disease.

(f) The sixth case was reported by the author in 1944. This case was of the advanced type and the patient died within a short time of the onset of the disease.

(g) The seventh case was reported by the author in 1944. This case was of the advanced type and the patient died within a short time of the onset of the disease.

(h) The eighth case was reported by the author in 1944. This case was of the advanced type and the patient died within a short time of the onset of the disease.

(i) The ninth case was reported by the author in 1944. This case was of the advanced type and the patient died within a short time of the onset of the disease.

(j) The tenth case was reported by the author in 1944. This case was of the advanced type and the patient died within a short time of the onset of the disease.

(k) The eleventh case was reported by the author in 1944. This case was of the advanced type and the patient died within a short time of the onset of the disease.

(l) The twelfth case was reported by the author in 1944. This case was of the advanced type and the patient died within a short time of the onset of the disease.

(g) Of the group of 7 cases which 5 cases of carcinoma and 2 lymphosarcoma (4) were reported from the post mortem cases of lymphosarcoma of the colon.

(h) In the years 1935 to 1938 87 patients with chronic ulcerative colitis were treated in the Clinic. Six of these cases were reported in the literature.

(i) In the years 1935 to 1938 87 patients with chronic ulcerative colitis were treated in the Clinic. Six of these cases were reported in the literature.

(j) In the years 1935 to 1938 87 patients with chronic ulcerative colitis were treated in the Clinic. Six of these cases were reported in the literature.

(k) In the years 1935 to 1938 87 patients with chronic ulcerative colitis were treated in the Clinic. Six of these cases were reported in the literature.

(l) In the years 1935 to 1938 87 patients with chronic ulcerative colitis were treated in the Clinic. Six of these cases were reported in the literature.

(m) In the years 1935 to 1938 87 patients with chronic ulcerative colitis were treated in the Clinic. Six of these cases were reported in the literature.

(n) In the years 1935 to 1938 87 patients with chronic ulcerative colitis were treated in the Clinic. Six of these cases were reported in the literature.

(o) In the years 1935 to 1938 87 patients with chronic ulcerative colitis were treated in the Clinic. Six of these cases were reported in the literature.

(p) In the years 1935 to 1938 87 patients with chronic ulcerative colitis were treated in the Clinic. Six of these cases were reported in the literature.

(q) In the years 1935 to 1938 87 patients with chronic ulcerative colitis were treated in the Clinic. Six of these cases were reported in the literature.

(r) In the years 1935 to 1938 87 patients with chronic ulcerative colitis were treated in the Clinic. Six of these cases were reported in the literature.

(s) In the years 1935 to 1938 87 patients with chronic ulcerative colitis were treated in the Clinic. Six of these cases were reported in the literature.

(t) In the years 1935 to 1938 87 patients with chronic ulcerative colitis were treated in the Clinic. Six of these cases were reported in the literature.

that malignancy while somewhat rare is most frequent in patients who have had ulcerative colitis for over five years. We have been following patients carefully for these last fifteen years and in those who have had symptoms for a long time an increasing incidence of carcinoma has been noted. This statement is especially important for once it is based upon further experience

at the Lahey Clinic it may be thought to alter somewhat the force of the negative expression made by Swinton and Warren at an earlier date (quotation on p. 63).

As has been pointed out the average incidence of carcinoma as calculated in the reported series of cases of chronic ulcerative colitis is 1.9 per cent. Statistically this figure would require the same

TABLE III—PUBLISHED REPORTS ON THE OCCURRENCE OF CARCINOMA IN GROUPS OF PATIENTS HAVING CHRONIC ULCERATIVE COLITIS

Author	Number of Cases of Ulcerative Colitis		Number of Cases of Carcinoma		Percentage
	No. Total	Group 1	No. Total	Group 1	
Mayo Clinic	60	60			5
Berggren	3	3	2	(3)	
Jackman & Helmholz		3	6		
H					—
Fed	83	8			—
Reuk	3				3
Willard	66	66			—
Martin & Scheff	35	35			6
Total					

pling of approximately 100 cases before a new average finding could be interpreted as having significance. It is interesting to note (Tables II and III) that the only published series in which no carcinoma was found are those numbering less than 100 (40, 66 and 83) cases. On the other hand in each of the larger series (183, 21 and 871 respectively) carcinomas were observed. Granting the statistical validity of this assumption calculation of the incidence with the inclusion of the three smaller series of less than 100 cases may have produced an abnormally low average figure on this basis it seems likely therefore that a figure of slightly more than 1 per cent may on the average express the incidence of association for these two diseases.

Sex incidence. Of the 1 cases in which the sex of the patient was recorded 8 occurred in males and 3 in females. These are too small numbers to have intrinsic significance. More data on this point are needed they are needed to aid in determining whether or not there may be a deviation in the incidence of carcinoma in patients with colitis from that in persons not so afflicted.

Age incidence. In 3 instances we have a record of the patient's age at the time when the carcinoma was discovered (Table IV). With these few figures the distribution according to age is shown in Table IV. Here again more recorded observations will be important.

In this connection attention needs to be called to one contribution of the greatest importance. Jackman, Bergen and Helmholz (37) reported a group of 95 patients who were less than sixteen years of age at the time of the onset of symptoms of chronic ulcerative colitis. As may be seen from Tables II and III 6 of these children later (after childhood) developed carcinomas an incidence of 6.3 per cent. Jackman and his associates pointed out that although carcinoma of the large bowel was found in 3.2 per cent of their entire group of 871 patients when this group of 95 (in which the symptoms of colitis had appeared during childhood) was studied separately carcinoma appeared nearly twice as frequently (6.3 per cent). Indeed as these authors state: "In general the only significant difference in complications between the two groups is the relatively high incidence of carcinoma of the colon among children."

Again it is unfortunate that more data on each member of this juvenile group were not recorded. It would be most instructive to know in each case the interval between the onset of the colitic symptoms and the discovery of the malignant change. In this group of 95 children colitis began in each year of life with greater incidence in each of the years from ten to sixteen inclusive. Were the 6 who developed carcinoma among these of the 95 in whom the colitis began in their early years or were they from among those in whom this condition began in the later period? Were these 6 children those who accounted for all of the cases that became malignant during the third decade (Table IV)? Can it be that the 1 case of lymphatic leucemia and the 2 cases of lymphosarcoma (so much more common in early life than is carcinoma) mentioned in the report by Bergen and Dixon (10) were among these 95 children? If so 2 or possibly 3 cases would need to be subtracted from the 6.

The duration of the colitis in years prior to the development of carcinoma is recorded for 9 cases and ranged from three fourths of a year to 2 cases to thirty six years in 1 case of great chronicity.

The segmental location of the carcinoma within the large intestine is recorded for 29 patients in 9 cases the carcinoma was in the rectum in 5 in the cecum in 3 in the transverse colon in 2 in the sigmoid in 2 in the hepatic flexure in 1 case in the splenic flexure and in 1 in the descending colon. In another instance the entire colon was involved. In 5 other cases multiple carcinomas were found in 1 of these cases the tumors were confined to the rectum in another there was a carcinoma in the rectum and one in the cecum in the third case carcinomas were found in the

TABLE IV—DECADE IN WHICH A CARCINOMA OF THE COLON WAS DISCOVERED IN 31 CASES OF CHRONIC ULCERATIVE COLITIS

Years by Decades	0-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89
No. of Cases	0	0	5	6	0	6	5	0	0

sigmoid and in the splenic flexure and in 2 cases multiple carcinomas were found but not localized in the description. A greater number of observations are needed to test the significance of the segmental distribution as well as of the occurrence of multiple tumors.

Thus an analysis of the recorded data seems to demonstrate an increased incidence of carcinoma among sufferers from chronic ulcerative colitis. However, before the increased incidence can be finally established the problem should be approached from two other points of view. In the first place the general hypothesis needs to be critically scrutinized and in the second place the hypothesis can be removed from the realm of argument only when supported by a greater number of observations.

GENERAL CRITICISM OF THE HYPOTHESIS

In chronic ulcerative colitis there is the following sequence of pathological circumstances: long continued inflammation, extensive damage to the bowel wall and more or less adequate repair (6). It would not be particularly surprising if such preparation did lead to a malignant change for in a variety of other conditions much clinical evidence has been assembled in favor of chronic irritation as a cause of cancer (12). It is not necessary to presuppose a neoplastic factor (15) peculiar to chronic ulcerative colitis and it is not to be required that a common cause for the two conditions should be demonstrated.

If chronic destructive lesions of the colon lead to an increased incidence of malignancy, a similar relationship might be expected in groups of cases of amebiasis and tuberculous colitis. Reports on such series would add importance to the literature.

A further study of the relationship of polyposis to carcinoma of the colon is in order and the place of polyps in relation to the carcinomas that develop in cases of chronic ulcerative colitis should be determined. Klemperer (38) has said, "A striking predilection for rectum and sigmoid is not evident for polyps as for carcinoma. More than 75 per cent of the latter are found in these parts of the colon while only 43 per cent of polyps are found in rectum and sigmoid. Further, more of the literature contains such contrasting opinions as those of Swinton and Warren (59) and Bergen (6) and in the future it will be important

to distinguish carefully between pseudo- and adenomatous polyps (45, 61).

General mortality statistics of recent date (*Special Report U. S. Bureau of the Census 1940*) indicate the high frequency of colonic cancer which accounts for about 11 per cent of all deaths from cancer. For this reason when dealing with data pertinent to the present problem an attitude of cautious discrimination must be maintained.

Finally, in the statistical evaluation of evidence for the elucidation of problems in which the mathematical preponderance is not likely to be dramatic the greatest care must be employed in the scrutiny of individual case reports in the inspection of source and in the critical assemblage of organized data. For example, in the utilization of reports from large and popular clinics assurance must be available that no factor of selection has entered as the result of a tendency to collect unusual cases, selection of this type or on any basis will distort the picture of the natural history of the disease.

THE HYPOTHESIS REQUIRES THE SUPPORT OF MORE OBSERVATIONS

The practical and theoretical importance of the hypothesis which is here considered cannot be denied. Attention is called to the paucity of available reports. In order to refute or to establish the hypothesis more detailed and more extensive data than has thus far been published are necessary. Probably a statistical study of possibly 5,000 cases of chronic ulcerative colitis will be essential and it seems likely that data in this amount are now in the records of gastroenterologists and proctologists of this country.

To be of proper value, future reports on groups of cases should regularly record certain information and individual reports should include the data required for their admission to a series. It would enhance their value if the following eight items were to be found in each case: (1) sex of the patient, (2) age of the patient when carcinoma was recognized, (3) duration of the colitis in years and/or months prior to the development of carcinoma, (4) number of cases of colitis observed among which carcinoma was sought as a complication, (5) diagnosis of carcinoma made by histological examination, (6) evidence of pre-existing polyp (inflammatory pseudopolyp or adenoma).

tous polyp) (7) segmental location of the carcinoma and (8) special features of the carcinoma (single multiple or diffuse)

SUMMARY

1 The literature contains a paucity of reports on the associated incidence of colonic carcinoma in chronic ulcerative colitis. The reports of only 98 cases have been found in which the diagnosis of the carcinoma was made histologically.

(a) Thirty three individual case records have been published.

(b) Sixty five cases have been reported in groups.

2 The literature contains a record of 7 series of cases of chronic ulcerative colitis in which the associated incidence of carcinoma was observed.

(a) Among a total of 1467 cases of chronic ulcerative colitis 28 patients developed carcinoma and the average incidence was 1.9 per cent.

(b) In isolated reported series the incidence was 0.0, 0.1, 1.6, 2.16 and 3.2 per cent.

(c) A single series of 95 children with chronic ulcerative colitis was studied. 6 carcinomas were found later in life an incidence of 6.3 per cent among this group.

3 From the practical and theoretical points of view the hypothesis that there is an increased incidence of carcinoma in chronic ulcerative colitis is an important concept.

(a) Available evidence appears to support the hypothesis.

(b) To finally establish the hypothesis a study based upon more extensive material and more complete data is necessary.

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ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

EYE

Berke R N Resection of the Levator Palpebrae Muscle for Ptosis with Anatomic Studies
Arch Ophthalmol 1945 33 69

The author discusses resection of the levator palpebrae superioris muscle for the correction of ptosis. He points out that ptosis may be acquired or congenital, unilateral or bilateral, partial or complete, and that the classification into three categories of resection of ptosis may be divided.

In one category the frontal muscle is utilized, in the second the superior rectus muscle is used, and in the third the levator palpebrae is resected or advanced. The last procedure is the operation of choice and aims to yield the best results provided that the levator muscle is not completely paralyzed.

Recessed recess but the levator muscle of the upper eyelid include the following: (1) shortening of the aponeurosis of the levator muscle (Erb's shortening of the levator muscle by excision of a part of the eyelid and resection of the tendon of the levator muscle through the skin (Wolff De Lapersonne's technique, Lancet, Blaschko, Whipple).

The advantages of operations on the levator muscle are as follows: (1) negligible postoperative reaction; (2) absence of lagophthalmos; (3) the eyelid moves with the eyeball; (4) the margin of the eyelid is not affected; (5) a good lid fold results; (6) no elevation of the brow results; (7) no diplopia develops; and (8) the wink reflex is not disturbed.

The disadvantages are that this procedure can be used only when the levator muscle is present and active and correct on may result and lagophthalmos may result if too much tissue is resected. Inadequate correction of ptosis by resection of the levator muscle through the conjunctiva may be attributed to untentative resection of Müller's muscle instead of the tendon of the levator muscle, resection of an insufficient amount of the levator tendon, ligation of the sutures or absence of the levator muscle. The author concludes from his experimental work that in resection of the levator muscle through the conjunctiva Müller's muscle and the tendon of the levator muscle are always dissected together.

JOHN ZUCKERMAN, M.D.

EAR

Baker E E The Cause of Inflammation of the Tympanic Membrane about the Eustachian Tube and Ear Pathology
Laryngoscope 1945 55 74

The author classifies the pathologic changes about the middle ear in four types as follows:

Type 1 in which there is no demonstrable lymphoid tissue about the orifice.

Type 2 in which there is a minimal amount of lymphoid tissue demonstrable.

Type 3 in which there is a moderate amount demonstrable.

Type 4 in which there is considerable lymphoid tissue about the orifice, sometimes lymphoid bands are present and the orifice of the tube has been narrowed.

Fifty cases are reported, all of which were subjected to adenoidectomy with the LaForce adenoidectomy.

J. H. F. DELANEY, M.D.

Kinney C E A Critical Review of the Fenestration Operation. Report of Cases
Laryngoscope 1945 55 7

The essential indications for the fenestration operation include bilateral progressive hearing impairment, essentially normal tympanic membranes, and intact ossicles, bilateral audiometric air conduction hearing loss of an average of 40 decibels, the frequencies between 256 and 4096 and a bilateral audiometric bone conduction no better than 25 decibels, and a loss of not greater than 25 decibels covering the same frequencies.

Prolonged observations on 3 cases of otosclerosis showed that the bone conduction response had been increasingly poor for the frequencies from 1024 up and and these the bone conduction loss had proved to be progressive. Of the 8 fenestration cases reported were in this group and these 2 failed to demonstrate a satisfactory hearing gain. The author therefore considers that a bone conduction curve showing a steadily decreasing response from 1024 up and is a contraindication for operation. An average threshold loss of less than 35 decibels for the 512, 256, and 1024 frequencies for air conduction and is considered the level of practical hearing. Psychologically however it is better to speak of the hearing percentage rather than the percentage of bone conduction loss.

For the recent results in 8 cases fenestrated over six months previously the method of determining the percentage of hearing recommended by the American Medical Association was utilized. On this basis an 8 per cent hearing or better can be considered as an excellent result or restoration to the practical level. Success was obtained in 4 of 8 cases. The result was unsatisfactory in the other 4 cases because of poor operative technique, infection, and closure of the fenestrum. According to the criteria outlined by the author the clinical results are 87.5 per cent of successful results are unwarrentable.

J. H. R. L. D. M. D.

33 of these the carcinoma occurred in n t x c nodular g iters (22 in solitary nodular and 11 in multinodular g iters) in 4 it occurred in to ic nodular (all multinodular) g iters and in pat ent the carcinoma occurred in a to ic d ifuse goiter The average age of the pat ents with ca ci oma was forty t o ye rs Thirty sev n per cent of the carcinomas were established to have arisen f m fetal adenomas and the auth rs estimate that an equ l number had a m lar origin but t s e egrowth prevented proof of th s Ninety per cent f the ca ci omas occurred in wome S ce a diagnosis of cancer was mad p operatively in o ly 21 per ct t f the cases (n 21 per cent of the ca ci th canc was fou d at ope ation and in 38 per cent it was diagnosed in the labo rat ry after operat o) the mporta ce f rem i g no t xic nod l g iters is obvious Radiation p f eably with radon seeds f llow g e c n f th carcinoma resulted i five y ar cure in 5 p r nt f the cases

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Lo 1 effects f od l g 1 About 2 per cent of th p tients with nod lar goiter e mpl n of pres sur symptoms ehiefl ferable to breathing

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r *s* complication *f* toxic nodular g ter *n*
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tha p ees esympt ms but the improv m nt in the
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The author includes the following data:

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inability of the patients to return for follow up. Operation was planned when the basal metabolic rate had reached 65 or more, and to one half the pre-treatment level. At operation the glands were much more vascular than glands in patients not subjected to thouracil treatment or in patients who had been given iodine preoperatively. Vitamins were given three or four days preoperatively.

Medication agreement consisted of the administration of 100 mg of thiouacil 0.1 gm every three hours for three days 0.1 gm every four hours for from three to six days then 0.5 or 0.3 gm daily for about three months follow which the maintenance dose was from 1 to 0.3 gm daily.

In 2 of the early cases crystalluria appeared. The administration of 0.67 gm f s d m bicarbonate with each dose of the racil was then instituted in all cases and no further development of crystalluria was exhibited. A corbic acid given in daily doses of 0.006 gm with liver extract and multivitamin preparation as thought to be counteracting the uric acid depressant effect on the bone marrow. The giving of vitamin sd did not seem to alter the lowering of the metabolic rate.

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it was also of value n contri l ng p t tng ed ma
Only exte o n al cases recd d i od

The results of treatment were as follows:

The results of treatment are as follows: In case failed to respond to thyroaural. The high initial basal metabolic rate the more rapid and dramatic was the response. In cases with cardiac decompensation more thyroaural as required to affect the pulse rate and to control the other thyrotoxic symptoms. Of the first 22 cases 9 developed transient leukopenia. Withholding the drug for a minimum of 5 days afterwards were methimazole effective and it did not return on the resumption of thyroaural.

All cases improv d subjectivly th n objectivly. The m st rap d decre se in the basal metabolic rate occur d ring th first m th tr tment the avg intal basal metabol c rat was +70 and at the d of nety d ys the rate was +10. Pat ents treat l wth thyroid or thyronin and thiou ac l seemd to co mo rap dly d wth fewer sid re ct ons th n p tie ts recei ng thi uracil alone.

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Leys D. Hyperthyroidism Treated with Methyl Thiouracil *Lancet* Lond. 945 48 46

Methyl thiouracil was used in the treatment of 16 patients with hyperthyroidism with good results. No toxic symptoms of importance were observed by the author.

We are ignorant of the cause of Graves' disease. There are few if any cases in which the entire circulatory system is purely local cause; the thyroid gland itself. Adenoma exists more often without than with hyperthyroidism. Proptosis, myasthenia, and possibly other features occur coincidentally but are dissociated from the symptoms directly attributable to an excess of thyroxine. Treatment with thyroxine alone by sedation by parathyroidectomy, or by thyroidectomy, or by adrenalectomy with a diuretic, or by thyroidectomy and circulatory thyroxine. The disease is thereby cured either because the relative thyroxine deficiency produced is sufficient to cause an overproduction, or because the original cause is itself a gland affected by the hyperthyroidism and disappears when this is corrected.

The discovery of the action of the parathyroid glands compounds on the thyroid gives us the power of regulating thyroid activity with an accuracy quite unsurpassed by other forms of treatment used for hyperthyroidism, and indeed unsurpassed by the whole field of endocrinology. For the present and until experience has fully determined the optimum conditions of treatment, it is best that the compounds should be used only by the specialist with full laboratory control. The following is exceedingly important and should be under the supervision of the specialist also. *Curr. Biol. Med.*

McClure R D and Lam C R. End Results in the Treatment of Hyperparathyroidism *A.S.* 945 3 454

Disorders of the parathyroid glands may give a history of urinary calculus, skeletal abnormalities, pathologic fractures, osteoporosis, and in some cases, Roentgenograms of the skull and long bones give a firmatory evidence. Laboratory tests clinch the diagnosis. There is levitation of the serum calcium and phosphate and lowering of the serum phosphorus. Six cases are reported.

Case 1. A woman, age forty-four, complained chiefly of pain in the right chest and right thigh. There was an effusion in the chest and the roentgenogram of the femur showed a definite process involving the lower third of the femur. A pathological fracture of the lower third of the left femur developed. Further studies were carried out. The patient died. Surgery on the parathyroid glands had not been performed. Parathyroid poisoning was considered as a cause of death.

Case 2. A woman, age fifty-one, had a pathological fracture of the femur. A cystic parathyroid adenoma was removed. The patient died from nephritis and hypoparathyroidism.

Case 3. A man, age fifty-one, presented a picture of cachexia. Roentgenograms of the skull and long bones showed osteoporosis. Small areas of calcification were present in the thickened ribs. Hyperparathyroidism was confirmed by laboratory studies. A parathyroid adenoma was removed on the right side. The patient made a remarkable and unexpected recovery with complete restoration of excellent health.

Case 4. A young man, age nineteen, complained chiefly of renal colic. An exploration of the neck for a parathyroid tumor was carried out. A parathyroid adenoma and an adenoma of the parathyroid tissue were removed. Conal scintigraphy was negative.

Case 5. A girl, age fourteen, complained of back pain. Laboratory studies showed abnormal renal function. Roentgenograms of the ribs were confirmatory. Surgery revealed an adenoma on the left parathyroid gland. Conal scintigraphy was abnormal. The back knee deformity cleared up without operation.

Case 6. A young girl, age eight, complained of a lump in the neck and pain in the right hip. A right parathyroid adenoma was removed. Recovery was complete.

The following patients have followed the operation and all appear to be normal: 11 patients.

Richard J. Benett, J. M.D.

SURGERY OF THE NERVOUS SYSTEM

PERIPHERAL NERVES

David L. Perry G. and Carroll W. Surgical Principles Underlying the Use of Craft in the Repair of Peripheral Nerve Injuries *A N S* 1945 1 686

The repair of peripheral nerve injuries has finally reached the state of a completely recognized definite plan of treatment. This has been due to the lack of argument concerning the histological changes associated with regeneration and the failure to follow up large groups of patients from a clinical viewpoint and thus evaluate the various surgical procedures.

The ideal method in the repair of a severed nerve is accurate end-to-end suture through the perineurium at the earliest time possible. This necessitates the use of very fine silk suture without damage to the nerve fascicles. In large wounds, especially when they are associated with fractures, the possibility of a severed nerve should be kept in mind. If the loss of nerve substance precludes primary suture, the nerve ends should be identified and a metallic suture clip applied to facilitate surgery at a future date.

It is very important that a potentially infected wound does not deteriorate from approximating the nerve ends for regenerating nerve fibers are quite resistant to infection and the perineurium forms an excellent barrier to the surrounding suppuration. Histological evidence reveals that the nerve fibers grow down into the distal segment; the presence of a surrounding suppuration, however, regenerative nerve occurrence when the nerve fascicle was infected.

The use of the suture materials has been a great advantage in preventing infections; histological studies not imply any letdown in performance; mechanical cleanliness allowed much earlier exploration; the possibility of performing a later anastomosis without the fear of an infectious flare-up—even when a primary infection has been present.

The use of nerve grafts has not received the credit it deserves. Cable grafts and chemically fixed grafts have not proved satisfactory. However, fresh autogenous and homologous grafts of sensibly the same size and fiber divided nerves should be used. Of these, only the homologous graft will through consistency be obtainable. The autogenous grafts are more satisfactory because they are genuine, the anatomical structure persists and results in a morphological structure. The homologous graft becomes a histomorphological structure as it is completely replaced and the neurotization follows a regular course. Nevertheless, satisfactory neurotization ensues. It is suggested that the distal suture line should be resutured and resutured because experimental observation has shown that by the time the nerve fibers have reached the site of anastomosis, the function may prevent further development.

Although the seriousness of concussive nerve damage in gunshot wounds has long been recognized, the authors describe in detail the actual histological changes that result. The immediate damage is much more extensive than seen in sharply severed nerves and extends for several centimeters both proximal and distal. This is differentiated from Wallerian degeneration in that a severe molecular decomposition of myelin and damage to the Schwann cell result while the mesodermal and neural elements survive. A resulting heteromorphous structure is then the regenerating picture.

An interesting finding was that in a very contusion injury into the continuity of the perineurium and result in an outgrowth of nerve fibers through the defect. This explains the many variations in return of function on lack of regeneration in contusion injuries to the peripheral nerve.

JACK I. WOOLFE, M.D.

BRAIN AND ITS COVERINGS CRANIAL NERVES

Robbins S. L. Brain Abscess Associated with Congenital Heart Disease *A M J* 1945 75 79

Only 26 cases of the rare syndrome of brain abscess with congenital heart disease have been reported in the literature; this includes the 3 forming the basis of this article. They were selected from 788 autopsies performed during the years from 1936 to 1943 at the Mallory Institute of Pathology of the Boston City Hospital.

The 3 cases are well documented and presented from the pathological point of view, although the clinical record is adequate. None was diagnosed before death. All 3 occurred in females aged between twelve and twenty years respectively. No focus of infection as found in any case and it was inferred that the involvement of the brain as due to septal embolism from some unknown source. The 3 cases presented the triad of Fallot which consists of (a) decompensation of the left (b) pulmonary stenosis (c) defect in the interventricular septum. One case had patent ductus arteriosus. Only 2 of the 26 cases in this literature were correctly diagnosed before death.

Attempts were made to produce focal areas of encephalomalacia in rabbits by injecting particulate material into the internal carotid artery followed in from ten to twelve days by the injection of virulent cultures of gangrenous tissue. The attempts were unsuccessful and work on this phase is in progress. The hope is expressed that in these cases of congenital heart disease with focal neurologic signs, correct diagnosis may permit the development of successful surgical intervention.

ADRIAN V. SWOOGAN, M.D.

Ehnl G J and Adson A W Lipoma of the Brain
Report of Case (Ch V P 31 Ch
94 53 99

Lipomas of the brain because of their true nature and the fact that most of them do not cause symptoms or signs during life a clinically unimportant mass. Most of them are unexpectedly encountered at autopsy. Up to the time the literature as far as the authors could ascertain does not contain data on any case of lipoma of the brain which was subjected to surgical treatment.

Lipoma of the brain was discovered in cases at the Mayo Clinic. In one of the cases the lesion was produced by symptoms which led to surgical removal.

With the 2 cases reported in this article 7 cases of lipoma of the brain of the intracranial cavity have been reported in the literature. The for and sites of origin in the order of frequency: the corpus callosum, the internal capsule, the structures of the choroid plexus, the ventricular walls, the lateral and third ventricles and the dorsal surface of the midbrain.

The mechanism of formation of the lipoma is probably a perversion of differentiation of the primitive elements. Element fat formation is potentialities are present in the meninges and the lipoma develops with ectodermal mesenchymal connection to the leptomeninges and the dura.

This tumor has slight local importance but it must be added to the list of lesions requiring differential diagnosis when calcification is demonstrated on roentgenological examination.

MISCELLANEOUS

Davi J H Morrow J and Tmey J A
Results in the Treatment of Meningococcal
Meningitis with Antitoxin and Sulfanilamide
Drugs J Pediatr 94 5 455

Results are reported in cases of 39 patients with cases of meningitis. The patients ranged in age from 2 months to 14 years. The clinical picture was logical in 21 cases of the heart and kidneys. In 18 cases liver and other organs were present. The treatment consisted in the administration of 100,000 to 400,000 units of meningococcal antitoxin combined with sulfanilamide or sulfadiazine in the older ages. The latter drug was used in half of the cases. The attack in the duration of the therapy was usually successful. In 15 cases the patients died. In 10 cases the patients survived. In 10 cases the patients died. In 10 cases the patients survived.

The total mortality rate was 39 per cent. 43 patients survived. Sulfadiazine did not seem to alter the mortality rate compared with that following the use of sulfanilamide. When the patients were moribund on admission the mortality rate was 75 per cent.

thirty-eight hours of admission the mortality rate 88 per cent (36 of 39). The elimination of further deaths which we due to second causes after apparent recovery from the meningitis reduces the mortality rate to 76 per cent.

The Watehouse Fund for the Medical Education of the Poor. The patients in the hospital and in the community. The patients in the hospital and in the community. The patients in the hospital and in the community.

H. A. S. and M. D.

Wint S J Th T atm nt of M n l goccocle
M n l giti n Children with S i g l f r a v e
ous Dose f Sodium S i f d i n J Pediatr
Louis 94 5 6 4 9

The cases of meningitis in children treated with a single intravenous dose of sulfadiazine. Eight cases were reported. The patients were treated with a single intravenous dose of sulfadiazine. The patients were treated with a single intravenous dose of sulfadiazine. The patients were treated with a single intravenous dose of sulfadiazine.

H. A. S. and M. D.

Ziegler L H and O good C W Edma d
Tr phl Pl tu ban f th Low r E t m l i e s
Complicating P r n l b o t o m y A h A
P y k h Ch 94 5 5 6

Of 9 patients having bilateral pleural effusions, 1 patient died. The patients were treated with a single intravenous dose of sulfadiazine. The patients were treated with a single intravenous dose of sulfadiazine. The patients were treated with a single intravenous dose of sulfadiazine.

Eight of the 7 patients with pleural effusions had difficulties in the treatment. The patients were treated with a single intravenous dose of sulfadiazine. The patients were treated with a single intravenous dose of sulfadiazine. The patients were treated with a single intravenous dose of sulfadiazine.

An attempt to correlate the current postoperative mortality rate with the preoperative mortality rate. The patients were treated with a single intravenous dose of sulfadiazine. The patients were treated with a single intravenous dose of sulfadiazine. The patients were treated with a single intravenous dose of sulfadiazine.

skull in relation to the plane of the coronal suture failed to give a definite answer. It did appear that there was a slightly better chance of avoiding these sequelae as well as persisting incontinence by performing lobotomy in the plane of the coronal suture or anterior to it rather than more posteriorly.

HARRY A. SUGGREN, M.D.

Brandes W. W. and Sutton J. B.: A Presacral Cyst Apparently Arising from the Nerve Root in a Newborn Infant. *Arch. Path. & Clin. 945* 39: 265.

Developmental anomalies are not infrequent in the sacrococcygeal region because of its complicated embryological evolution. In this region early in embryonic life the neuroenteric canal, a communication between the central canal of the spinal cord and the postanal gut. In adult life the postanal gut and the neuroenteric canal are obliterated.

A great variety of tumors with various descriptions have been described in this region. The author's case is unique in that the cyst was lined throughout with well differentiated glial tissue of uniform thickness. Ependymal cells were present in scattered areas. The structure of the cyst and its position anterior to the sacrum suggested that it arose from the neuroenteric canal because the main lining was neural tissue.

The infant girl three days of age was admitted with a cystic mass the size of a grapefruit situated posterior to the rectum and anterior to the sacrum.

Urination and defecation were not interfered with although the tumor grew very rapidly in size in the three days following birth. There were no clinical indications of any connection with the central nervous system.

The growth was successfully removed at operation. ARIEL V. SUGGREN, M.D.

Stern K. and Odum G. L.: Morphological Alterations of the Neuron Due to Tumor Invasion. *Arch. Path. & Clin. 945* 39: 1.

The reaction of the neurons to various intoxications and circulatory disturbances are well known and the reaction of these cells to adjacent pressure has also been studied. In this article the reaction of the neuron to invasion by glioma cells is studied. Postmortem material only was used and various types of gliomatous tumors were found in this series of 36 tumors. Stains of all kinds were employed to show changes in the nerve cell.

Intact neurons were found at various depths within the tumor and there was often no intermediate stage between complete preservation and complete destruction of the cells. Most of the changes seen were explained on the basis of simple atrophy due to pressure. The changes usually seen in circulatory, infectious or intoxication diseases were entirely absent in the neurons found in various parts of the gliomatous tumors and a surprising number of the neurons remained intact in the depths of such tumors.

ADRIAN E. ERNST, M.D.

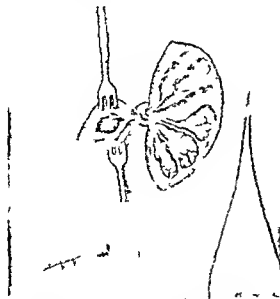
SURGERY OF THE THORAX

CHEST WALL AND BREAST

Wak I y C P G Duct Papillomas 1th Breast
Br J M J 1945 1 436

Duct papillomas are usually slow growing and in the large ducts and are therefore situated beneath the nipple or the areola. The majority of these tumors are single but in some cases multiple papillary growths are to be found within the ducts. The common single papilloma often has a stalk and some pathologists have termed it single stalk papilloma. It always occurs beneath the nipple and frequently causes bleeding from it.

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the surgeon to make a d ferential diagno is of the e
the c nd tions



Figs. Diagram illustrating the dissection of papillom. The diagram shows the host is dissected to show the latent virus during the period of latency. Inset: The skin in situ united by sutures.

Every case must be examined carefully and at definite intervals until it is certain that a delayed cicatrix can be felt. When this is established local excision of the delayed cicatrix with the papilloma can be undertaken. The incision should radiate from the nipple over the delayed cicatrix. The skin edges are held apart, the cystic dilatation is opened, and the intracystic papilla is completely excised. The operation is simple and no damage done to the ducts on the side. The skin incision is closed with a few interrupted sutures and when healed is scarcely noticeable.

Every excised papilloma should be examined microscopically for a evidence of malignant change. The patient should be examined at three months intervals during the first year after this time a yearly examination will suffice.

STEPHEN A. ZUM, M.D.

TRACHEA LUNGS AND PLEURA

Tlancy W S Moe s h H J and McDo Id J R
T more fth Trach a t h Of ls Ch 945
4 34

The present study based on a series of 137 cases of neoplasm of the trachea seen at the Mayo Clinic.

C r i s t o m a m a y c o c c u r a n y w h e r e i n t h e t a c h e
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Only 3 p e n t s h d n v e n t o n f t k l g o l
a l u m p n t h e t h r a t T h m o s t f e q n t a d m p
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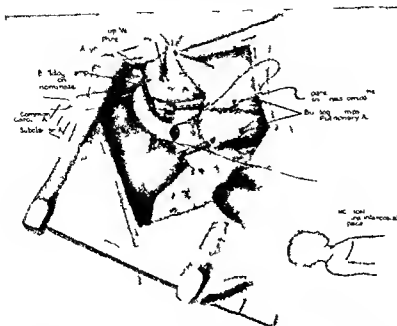


Fig 1. General exposure of the pericardial field. The right end of the innominate artery is being anastomosed to the side of the right pulmonary artery. The posterior wall of the thoracic duct is being exposed.

ble by with a malform heart as considered beyond the reach of surgical help. In the past three months the authors reported 3 children with severe degrees of pulmonary stenosis and each of the patients was greatly benefited. The results have been sufficiently encouraging to warrant a preliminary report.

These operations were undertaken with the conviction that even though the structure of the heart as grossly abnormal it might be possible to alter the course of the circulation so as to lessen cyanosis and the resultant disability. The cyanosis present in the infant but is obviously a simple manifestation of the following conditions: 1. Incomplete right ventricular septal defect. 2. Cyanosis appears when there is at least 5 gm of reduced hemoglobin (100 cc of circulating blood). 3. Of the principal factors producing cyanosis in malform heart, the direct hunting of venous blood into the systemic circulation. 4. Digaard and V. Slyke list the important factors in the cause of cyanosis:

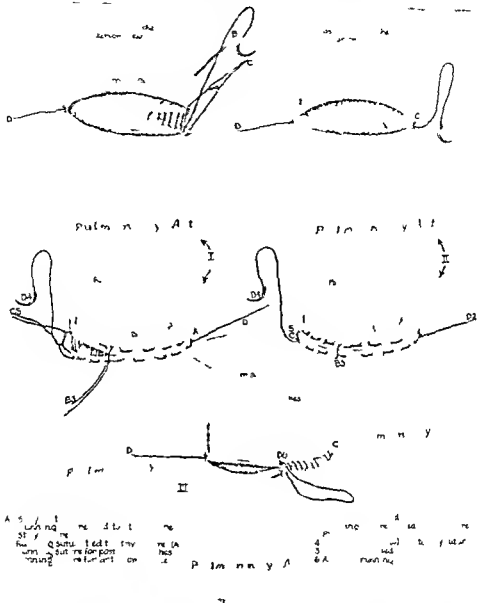
1. The red content of the hemoglobin.
2. The volume of blood hunted to the systemic circulation.
3. The rate of transit of oxygen by the peripheral tissues.
4. The extent of anoxia of the blood in the peripheral tissues.

These estimates show that in cases with a first and polycythemic second change occurs in the lungs which we call venous stasis. The

blood passing through the lungs was no longer in effective contact with the oxygen in the alveoli. These specific pulmonary factors may overshadow a other equally important factor—the volume of blood which reaches the lungs for a rate.

The circulation of blood through the lungs after birth is essential to life. All infants with pulmonary stenosis without a right ventricle and without a ductus arteriosus of the aorta in whom the closure of the ductus closes off the circulation to the lungs die at an early age.

Two different types of congenital malformation illustrate the importance of the volume of pulmonary circulation in producing cyanosis. If there is a single entrance of rudimentary tricuspid valve usually great vessels are in off with common ventricle and a rudimentary vessel of small size from the outlet chamber. If the great vessel is the aorta and the left pulmonary artery arises from the large volume of blood goes to the systemic circulation and the cyanosis is intense. If the vessels are reversed the large volume of blood goes to the lungs for aeration and there is minimal or absent cyanosis. If the pulmonary artery arises from the heart to connect with the aorta the circulation of the blood to the lungs occurs through the bronchial arteries only and cyanosis is intense. If there are anomalies of the pulmonary veins, the pulmonary veins drain into the right atrium, the arterial and venous blood mix and a large volume of blood reaches the lungs for oxygenation. Unless there is cardiac enlargement in the



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as the ideal vessel to anastomose to the side of the pulmonary artery but later cases showed the innominate artery preferable in patients with a severe degree of anoma.

Except for slight variations in the 3 cases the method for procedures were as follows:

Light general anesthesia with ether or cyclopropane was used. The patient was placed on his back with the head slightly elevated (the operation was performed on the other side according to the position of the great vessels and the artery to be used in anastomosis). The incision was made in the third interspace and extended from the sternum to the axillary line. The pleural cavity was entered and the third and fourth costal cartilages were cut to allow the ribs to be spread and general exposure as in Figure 1. The right or left pulmonary artery was exposed and freed from the adjacent tissues as far as possible. On the right side this was more difficult and necessitated division of the azygos vein and retraction of the superior vena cava medially.

The jugular vessel (subclavian or innominate artery) was then freed and its origin to the aorta occluded with a bulldog arterial clamp. When the innominate artery was used its branches, the subclavian and the common carotid, were ligated at their origins and the innominate artery was cut just proximal to the ligatures. In using the subclavian the thoracic vena cava, the internal mammary branches had to be divided to provide sufficient length of vessel. The right or left pulmonary artery was then occluded with a bulldog clamp just distal to the division point of the main pulmonary artery. A second clamp was placed just proximal to the point where the elastic cuff bunched to the upper lobe of the lung. A transverse opening in the vessel was made between the clamps the same diameter as the systemic vessel to be anastomosed to it. The pulmonary artery was not occluded until all preparations for the anastomosis had been made. For the anastomosis fine silk on a curved needle was used. A stay suture was placed at one end and a running suture inserted which was not drawn tight until the greater part of the posterior row was in place. The stay suture was then tied and the running suture entered was tied to the stay. The posterior row was completed and the two distal stay sutures were tied. The tension was a continuous thing and through the anastomosis into the main trunk. Figure 2 shows the bulldog clamps were removed and any blood was stopped by the use of distal ligatures. The lung was repositioned and the chest wall closed with braided silk to approximate the rib. The chest incision was closed with multiple layers of interrupted silk sutures.

Three cases reported in detail and in brief the case as a case of degree of pulmonary stenosis with inadequate circulation to the lungs. Although each patient had different details in the anastomosis the operation generally consisted of the following: The first case (Fig. 3) the distal subclavian artery anastomosis distal to the

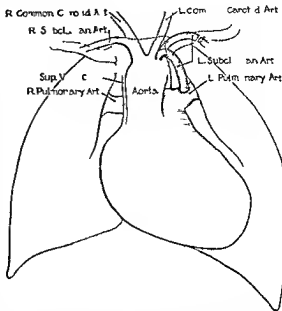


Fig. 3. The distal subclavian artery was anastomosed to the distal subclavian artery.

the left pulmonary artery. The patient was a small weight baby who had been steadily losing ground. After operation the clinical improvement was remarkable. The baby's appetite improved, he gained weight and is now starting to talk.

The second patient had a right aorta and it was possible to anastomose the innominate artery to the left pulmonary artery (Fig. 4). This patient was deeply cyanotic and severely incapacitated—she was unable to walk with uterine tubes. Two and one-half weeks after the operation he walked 60 feet, rested a while and walked 60 feet back with uterine tubes. Before the operation the oxygen saturation of the arterial blood was 36.3 per cent and three weeks after the operation it had risen to 82.8 per cent. The red blood cell count dropped from 7.5 to 6 million, the hemoglobin from 24 to 17 gm. and the hematocrit from 71 to 55.

The same operation was performed in the third case but here the aorta was in the normal position. The operation was done on the right side—anastomosis of the end of the innominate artery to the distal of the right pulmonary artery (Fig. 5). The improvement was dramatic. The child had been deeply cyanotic before the operation but now his color was good even without oxygen after the operation. There was a marked improvement in his dyspnea and by the third postoperative week he was walking 40 feet without panting or becoming cyanotic. The oxygen saturation rose from 35.5 to 79.7 in 10 days and by the 15th day it was 83.8 per cent. The red blood count fell from 10 to 6 million with a corresponding fall in the hematocrit and hemoglobin.

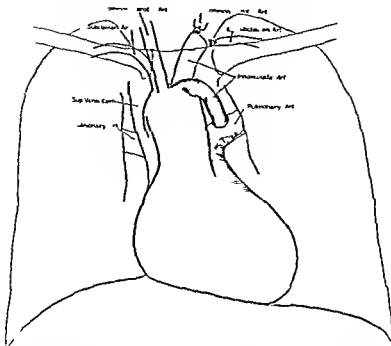


Fig 4 Procedure used. The patient had a right subclavian ductus arteriosus. The ductus was ligated and the left subclavian artery anastomosed to the ductus.

The authors were first of all that an infant with a patent ductus arteriosus would not tolerate a long operation. The procedure in closing the patent ductus arteriosus is not a simple one. The type of anastomosis to be performed depends on the age of the patient, the anatomical position of the ductus, the degree of stenosis. The authors suggest that anastomosis of the subclavian or innominate artery to the side of the right or left pulmonary artery. The patient is placed in a position which allows systemic blood to flow to the lungs. The continuous monitoring of both sides of the chest is carried out so that the anastomosis does not bleed. The subclavian artery is the best to anastomose, but its use is in a small number of cases. The blood to the lungs is supplied by the ductus arteriosus. The blood to the lungs is supplied by the ductus arteriosus. The blood to the lungs is supplied by the ductus arteriosus.

Another question answered by these 3 cases is: Would patients suffer from a decrease in the amount of blood to the lungs? The period of occlusion was approximately 15 to 20 minutes and the results were satisfactory. The blood to the lungs is supplied by the ductus arteriosus. The blood to the lungs is supplied by the ductus arteriosus. The blood to the lungs is supplied by the ductus arteriosus.

The use of the subclavian artery for the anastomosis is not recommended because of the possibility of the formation of a thrombus in the subclavian artery. The authors suggest that the ductus arteriosus should be closed by the use of the ductus arteriosus.

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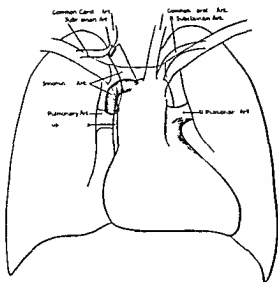


Fig. 5 The descending aorta anastomosed to the side of the right pulmonary artery

- 2 Anastomosis of the distal proximal end of the subclavian to the common carotid artery to the distal proximal end of the pulmonary artery to an upper lobe of one of the lungs
 - 3 Anastomosis of the side of the aorta to the side of the left pulmonary artery
 - 4 Anastomosis of the side of the aorta to the main pulmonary artery
- Of the possible complications of these operations, the danger of thrombosis at the anastomotic site. The improvement of the 3 patients described indicated that it did not occur. As the patients usually have polycythemia, an increased viscosity of the blood, the authors suggested cumarol in small daily doses controlled by daily prothrombin determination. The medication was continued for a three weeks period after the operation. Distal anastomosis cases may be questioned.

The types of bronchial which should be considered by the patient are the tetralogy of Fallot, pulmonary stenosis, and the tetralogy of Fallot. The improvement of the 3 patients described indicated that it did not occur. As the patients usually have polycythemia, an increased viscosity of the blood, the authors suggested cumarol in small daily doses controlled by daily prothrombin determination. The medication was continued for a three weeks period after the operation. Distal anastomosis cases may be questioned.

ESOPHAGUS AND MEDIASTINUM

Harpe R A K. and Tiscenco E. Benign Tumor of the Esophagus and Its Differential Diagnosis
B & J Rad 1 945 8 99

Benign tumors of the alimentary tract as a group are not infrequent but are relatively rare as compared with malignant conditions.

The clinical symptoms can be briefly summarized in the approximate descending order of frequency: (1) intermittent retrosternal sensation of dull pain or of pressure or of an aching sensation which was usually referred to the lower or middle part of the sternum being sometimes aggravated by lying on the back (2) epigastric pain after meals or without any relation to food (3) anorexia (4) dysphagia often the intermittent type (5) occasional vomiting or a copious vomiting due to dilatation of the esophagus similar to achalasia and (6) loss of weight.

The author reports a case in which the diagnosis of a benign intrinsic amucosal tumor of the esophagus was made histogenologically. The male patient age forty-one was operated on and the tumor was found on the posterolateral side of the esophagus. The mucosa was found to be intact. The only pedicle was of avascular fibrous tissue. The microscopic appearance was that of a leiomyoma.

The author concludes from his observation that the histogenologic diagnosis of an intrinsic traumatic tumor of the esophagus is a diagnosis by exclusion.

It is his view that a distinction has to be made primarily between extrinsic and intrinsic conditions and secondly between the mucosal and extramucosal origin of the intrinsic process.

In the superior mediastinum direct pressure on the esophagus can be exerted by an aneurysm of the posterior part of the aortic arch, an aneurysm of the left subclavian artery, or enlarged parathyroid or retroesophageal glands but rarely by a retrosternal goiter, neurofibroma, esophageal leiomyoma, diverticulum, substernal lymphadenoma, or cold abscess of the upper thoracic spine. Indirect pressure may be transmitted by the chest pushed posterolaterally by aneurysm of the innominate artery.

From the middle mediastinum the esophagus can be distended by indirect pressure from an aneurysm of the root of the aorta which pushes the tracheal bifurcation backward, aneurysm of the ascending aorta pushing the trachea at the right or aneurysm of the descending aorta pressing upon the left main bronchus. By direct contact the distention of the esophagus could be brought about by an aneurysm of the junction of the trachea with the descending aorta, bronchial carcinoma particularly of the left main bronchus, enlargement of the left atricle of the left ventricle, pericardial effusion, and of course also by enlarged gland (thyroid, parathyroid, malignant and lymphoblastoma) and glandular enlargement (thyroid, parathyroid, lymphomatous cystic tumor of fibrous mediastinum).

From the post a median mth outline of the esophagus could be distorted directly by an aneurysm of the descending aorta kinked t ruous art nosclerotic thoracic aorta chronic diffuse fibr s m dast natus posterior mediastinal h r n a (part c uly n t n on pneumohydrothorax) o any mas i e t m and nd r ctly by f i s d d gangloneuromas which might ex rt p essu e h v displ cement of the desce d gaorta ante omedially

Generally speaking the effect of an e n t c p cess upon the esophagus m y be twofold def r mity hy traction a d d f r mty by p ess e The form is commonly the fature of dhere t tube culo glands or of fib s m dast natus The de f r mty by xtrinsic p ess s u ally comp ble w th the f mlar appe ce f the aotie rech im p ess on o w th that of n enja g d left auncle

Strictly speaking there is n d bt that a c t m i c mas w h t attached not mght m l e the imp es n of nt n e e tram cosal condit ion

A different diagnosis c l e may be looked for in the c nt by h ch th circumf nce of the oft t sue mas appe rs attached t th esophagus In th nt ins c e tramucosal tum the greater p t of th c i c m f r e n c e f th visib le s t tissue mas w ld be w th n the p essure def ct whereas the e t nsic t mor a rel t ly m l l r part of the c i m f r e n c e o ld mak co tact with the esophage l utline

Stessul d by the a th on the f k l l e appe ance f th barum sh d w res l t ng from th split g of th barum col m n as t m p ges on th protrud t m r mas s th t th barum w ld s m t t ckle al ng a k d f a gutt rone ch s d f the t mo Jos u K NAR MD

Tru d l P E A New Guid in the Operati n f r Esoph g eal fistulas f r m l of the Diaphragm J Tho S g 945 4 60

The g ealt atm t of esophage l hatus h n a t as not be g nerally ad pt d e n among s r g ns Many patients w th th s co d t on co t nue t s f f en on d etary d med cal man g m nt nd g r y not conside d beca s of th st s nes of the p c d e nd the h g m t f ity th n th of the su l h r m o bap h v Inst d f a st d r d perati proceed re ch as s u d f o th fo ms of h n th t chnq e f d e l g w th th s c nd h t s i es ph g l hat s h r n as t l l u d nt r s y d a umplificati on f m th d is desirable

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atitis or aortic aneurysm may produce the s mptoms

Truesdal operates n hatus h n aft it has beend monstard b x ays and aft ll cond t ns w th s mlar sympt ms hav b n ruled out as com p t ly as modern methods of diagn s p e m t l l p es nts a e r s of 50 cases 6 of which e e per t d pon through th thorax and 24 by th bd m n a f approach If fa ors the th racic approach s ce t off r s b e t t e r p o s u e a d a d e f n t a n a t m i c a f landmark f r locati g the he mial s c Th r w 4 deaths among the 50 p t e t 8 p e r t m t a l t y Three d e t h s (1 5 p c e t) occurred th group operated upo thr gh th bd me and d ath occurred in the 6 p eated pon th gh th a x Two of the d th s e f o m m d a s t t f l l n g esophage l j y On pati nt d d f p e r t i n s due to p e f r a t n b y a s l s u t u r e u e d t a c h o r the card t th d a p h r a g m The last d e t h c u r r e d from c e b a l a c c i d e n t t w e t y d i f t r e o p e r a t

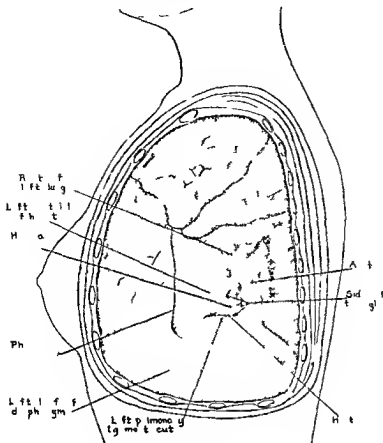
The autho h l s th t 3 f th d a t h s w d a b l e a d that accu t e k l d g of the loc t n of the s c careful o d e l y p c d u r e d c a e not to ut th stom ch t any part of th ated diaph agm w l l e d t b t t e r r e l t s

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R E T R B L O M D

MISCELLANEOUS

Savag O Pulm ry Concu in (Bl t) in
N nthoraci B tti W und La t Lo d
945 48 4 4

Complete amputation was made of 87 battle
c ulter wounds in the thoracic wall.
Most of these patients were unconscious while
under observation. There had been considerable
of the chest damage so that the pulmonary mor-
phology which we present was unexpected but
even in the late cases in which clinical signs of pul-
monary abscess were particularly looked for
the wound was quiet. No of the patients had
hemiparesis. The pleura was not lightly ruptured
and the blood pressure as the normal limit.
Symptomatic distention of the trachea and
present in many cases. Physical signs: the

chest was minimal. Roentgenography presented
evidence of trapped lung in the hemithorax. The
shape of the diaphragm rather flattened. The
hemorrhages found at autopsy were

found in the anterior mortem punctures. The
In the majority of cases the lung was free of
no change but striking pattern of hemorrhages was
seen on section in many cases the hemorrhages had
coalesced to form a confluent flat nodule;
the lobes do not normally post-resection
phenomena. The distribution of the hemorrhages
though tabular uniform from periphery to
hilum. Hemorrhages on the parietal pleura and be-
neath the visceral pleura were present in all
cases.

In patients who have been posed to bleed how-
ever in the case of those who were the wound was
whose pleural tears were lightly ruptured and whose
blood pressure was within normal limits. The
spleen should be given the possible presence
of unsuspected alveolar hemorrhage.

S. M. KERN, M.D.

SURGERY OF THE ABDOMEN

GASTROINTESTINAL TRACT

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38 93

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B JAMI GOLDMAN MD

Smith C S Wik ff H L nd S th rd B A
G tri Acidity In App ntly Healthy In
di tris Am J D g t Ds 1945 17

The auth rs p esent the findi gs in a s t es of
fractional gast ic analyses co duct d f the past
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and 60 deg es Considerably l w lues we e
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Th ma mal v lue fo any s bject 90 d g es
Mo tha h lf of the tot l numbe of s bjects
r ched th r total maximal cid ty by th nd of
forty fiv m ntes inst ad f f t om s ty to
n nty m ntes as g en in the t t books The
ma mal s l es f f ee hyd chl cid n th s
s by cts r port d n agr e w th the t book l es
s me h t bett th ndo th val e for t l acid ty
In 9 s by cts th ma mal f e hyd ochl c cid
bet e 9 a d 59 d g ees that in th t t book
va i d f r m 2 t 7 deg II er of the t tal
umb of suby cts 8 ach d th m m m l lu
l les than the st ty m ute int r v l ad t h
ormal

S c thes res lts a i d s g e tlv be c m
pared th each oth and w th th p bl sh d t nd

ards a further in est gat n as cond cted n h ch
a few indi duals were used r peat d ly as subjects
I r fractional gastric analyses These persons were
in good health and had no gastr c di t bances He e
aga n consi derable variation in the gastr c ac dity of
the indi du l subjects w s shown by repeate l anal
yses of the same subject carr ed out at i te v ls of a
few d ys Marmas J SEIFER MD

Aron A II Inflammatory Le ion of the Uppe
Gastrointestinal Tract J Am M Ass 1945
127 1 27

This was a pap p esented b fo e a joint med cal
nd s gical meeting in which the author d scussed
certain advances in the diagn sis and treatme t of
les ons of the stomach a d duod n m that have
taken place n the p st few years

S nc it is important t assure a patient with an
ulcerated lesion of the tomach when complete h al
ing is pres nt the auth r suggests the followi g
crite r for healing of ulcerated lesions of the
tomach (1) complete cessation of all sympt ms (2)
maint ance orga in eight (3) persistent absence
f occult bl od f m the feces (4) d pp arance of
the anemia f the iron deficiency and essential factor
typ (5) n rmal sedimentation rat (6) r entgen
l g cal evid nce f complete h aling and (7) if it is
po sible to btain t confirm tion by gastroscopy
Only when these t dies ar repeat d ov r four t
s x k perod of obs rvation can we be ure th t a
lso of th stomach has he led nd ma d
healed and thus mo t likely to be beng If this
does n t occur the pat nt s ntitled to surg cal
nterv ntion

F dyc B St J hn out ly am ned by fluoro
scope the st mach and d oden m of 413 p ti ts
without d est ympt ms and found 54 with
deform d d oden l b lb S me p esented c at s
but th major ty had c rs of h al d lc rs 7 h d
card p sm 5 had d aph gmatic hern (2 very
larg) 2 had stomach ca cinom s had a lymph
sa coma of the st mach nd had a g st c p lyp
M y funct nald ang m nts of ton m t l ty and
mptyi ng time lso were r cal d Th author
b l es th t trout e ma a y g of the upper
g t o ntesti al t ct may in time attain the same
m po tance as m lla st d s of the lung

Burd L m p a d M y c l l cted 243 pr ed
case f pept c ulcer n child en r n pati nt
rangi g f om 1 fa c y t s n years of g h h
w e of acut nat e d th ema d r m p t ts
h t een the ages l se n a d f f t n y a h ch
rev led ch ct t es l ke those n adult Of th
13 l d rch l d en 78 er male and 45 f mal F ghty
fiv l the ulcers w e in the d den m l y
Th th c ncl des fr m ths den eth th ch l d en
with cont ed d g est e d t ba c sh l d h e
their pper gast ointest al t ct stud d by mean

Let sh wel that 4 p r e n t f t h j t n t
t a l s h a g l e n i g n g s t r i c u l c r j o e d t o
h c a n c r T h e p t i e t s r e s p d d l l t c o n
t e t h r p a t i r t l o s g t h s y m p t o m s a n d
g n n g p s l v l o s t i g h t O f t n t h e l s n
a p p e a d t d m n i s h u n s z e n n t g n a n d g a t o
s e p a m n a t n s O c c a s i o n a l l y s u c h a n l e e
p r e o u s l y d e m o t r a t e d b y b o t h m e t h o d w a o t
r e c o g z b l f t e r m n t h l t a t m n t I t
d i f f i c u l t t o p l a n t h e e a r l y h e h v o r o f o m
m l g n n t u l c r a t i o n f t h e t m h T h i m p o v e
m e t i t h r e g a r d t h e s y m p t o m s a n d i g h t o f
t h p a t i e n t s e s e t u d r s t n d n c w i t h b e d
r e s t a n d n n r r i t t i n g f d s e c o n d a r y n f l a m m a
t r y r e t o s a l l e v a t e d G u t t i s d i s a p p e a r s a n d
c o m f r t p l a c e s p a i n g a e u s e u e t a t i n s n u s e a
n d a r e a T h d e c e a s e n s e f t h e l e r a t n
m a y b d t t h u b s e n d e n o f i n f l a m m a t i o n
b o t h u l c e P o b l y t h c r a t e r m y b l e e l d
b y g a n g l i o n t i s s u e a c t u a l l y b y c a n c e r c e l l s

I n o r d e t a a t b t t d a g n o n t h e e a r l y
m l g a n t l e o n s t h a u t h s t d d l s o r d s f r
c o m m f a c t r s p e r t i n g t h g u p o f p a t i e n t s
H i s t o r y n f o r t o n a s d e m d f r o m a n l y s i
f t h l o c t o n f t h e l e t h e a g o f t h p t n t
d t h e d i a t i o n f h s s y m p t m G s t r i c n a l v i s
p t e u l y a s r e g d i r e e d t y a n d t h e o f
t h u l c e t n w a l e v a l u b l D t a c c e n g
t h t y p d r a d i a t i o n o f p a i n a n d t h r t o f l e l
g t h c o r v a t e t h p y e e f n o v l
U l a t o n t h i r m e d t c m f t m a c h
p x m a l t o t h p y l r u s i p t o b e m a l i g n t
g a d l s o f t h e s f t h e l e n T l a s t r u e n
65 p e n t o f t h e t h r c N a r l u l c e r s
f t h g a t e r c v t u a n d t h e f i n d u o f t h e
s t m c h a r c a n c U l r s n o l v i g t h e n t r
p o s t r w a l l p e d t b a n c r m o p e c e n t
o f t h c a s l i f t h l a s s e r c u a t u r e a n d
t h o s o f t h p y l o r u t e l f h d m a l g n y i n o
p e n t i n a s m u c h o c h l f f l u l c e t n s o f
t h e t m c h o r g a n t e o n t h e l r a t t h
t h f u d t h a t m o t o f t h d g n t i c s
c e l t h r e g a d t o t h e l o n s f t h r e g n

P t n s a t h l e r a t i e l i f t h s t o m c h
f t e m i d d l l e f t i g h l s y m p t o m s f i l e t h
r s i e t m e s m o r e l l y t o h a c r c e
s t d f u l c I f o n t h e o t h e h n d p a t n t i n
t h a g g o u p h a d h a d s y m p t o m f i n o r m o e
y a r s t h v e w a s t E v e y c l n b o u l d
s l c n d e a y p t e t h a p p a l s o f d
c b t a n y d g t o m p l n t t h a t b e g s
a f t i g f f o t T h d g o s f m a l g n a c y
m t b r u l e d t y a l l f t h a d t r d p l
H a l l a t l e f t h s t m a c h i s d e m
t t d d l t h p v h o l d l s t u t e d n
a s t b l a g m t c a n h m a d l t n t h
t y p f l n p a t e u l y t h t p a l h a t e m a r s
m v c o f t h e t e s s e d l m o s t n d r o u r
J e s n a l y b l e c a n c e m y b m h o p e
l l y l p e r a b l e
T h s e o f t h u l c e r m y b m l a d g c a
e p r e s e n t a l e t h a t l s t h m

i n l a m e t e r O n t h e o t h e r h a n d n o m o u s b e n g
l s i n s g a n g t h e c l i n c a l i m p e s o o f u f o r a l l e
c a n r h a v e b e e n c o u n t e r e d W c a n n l y u
m i s e t h a t t h e l e s i o n s b n i g f i t s m l l n e i t
i s i n o o f t h e s a f e o n e s i f i t o c c r s i n y u n g
d d u l s o f i t i f o n d n a p t i n t i t h y m p
t o m f r m n y a r

F e h y d r o c h l o r i c a c i d w s f o u n d i t h q u a l
a b u d a n c e i n t h e u l c e r c a n c e r g r o u p s i n t h
g o u p w i t h d e f i n i t e l y p d b n g n u l c r O f a
p a l l e l g r o p o f p a t n t s p r o v e d t o h a v e c n c r o f
t h e t m a c h 60 p r e c e n t s h o e d n f r e h y d o c h l o
c a c i d o n g a s t r i c a l y s T h e r e f r e t h p r e s e c f
f r e e a c d i o f l i t t l h e l p n t h l i f e e n t a l d i g n o s i s
T h a b s n c c f f e e a c i d h o e e r i s d e f i n t l y i n
f a v o r o f c a n c e r

T o o m u c h l a n h a s b e n p l c e i o n t h e a m o u n t
o f p a n a s s o c i a t e d w i t h g t u l c e t i o n s T h e
c o m m a b e l f t h t p a i n i d e a t e b n i g n u l c s
e o n e o u s M a n y o f t h e u l c e s i n t h a u t h o r s
e s t h a t p r o v e d t o b e c a n c r p r o d d p a i n t h t
a s l i d b y f o d r a l k a l i e s n a c t l y t h e s a m e
m a n n e s a t h e b n g n g p E c n f a n u l c e r a t i o n
h a p p a e n t l y l l a f t e r o e m n g h o i d e l h o
p a t i a t e a t m e n t t h r e h l d l a c f l r x a m
n t o n t f r f o u o s i w e e k s A n y e v i d e n c e o f l a c k
o f c m p l e t e h e a l g o r t u r n f u l c e t o n h u l d b e
n s i d e d s u f f i c i e n t w t a l y s u r g e v

I n t h e u t h r s g u p o f q u e t i o n b l e s n s i t
w s f u n d t h t v h r e e c t n h a d b e n d o e n t h e
d a g n s o f b e n g n u l r o n l y t h t h p a t h o l
g t i n d t h a t t h l e i n w a s c a c e t h e f i v v e a
c r a t e r s e d t o 40 p e n t I t q u i t e v i d e n t
t h t t h u r g e n h l d i n c l d e t h e n d a l a s
h u e s t o n s f o l l u d u b f l e a t i o n T h i d d
l i t t l e t o t h e h a r d o f t h e p a t n a n d g s t h
p a t n t b e t c a n c e r c u r e I t i s b o l e t h t
w s h o u l d m e f q u a n t i t y m a k e a i r r e s e c t i o n
O f t n a s m p l e t o t l g a s t r c t m y v h c h l n i s t s l
t o b e t t e r l i m n a t i o n o f t h n o d l e t h n m n y
s u b t o l l t n s c a n b e d o n f e l y T h s t r u
p a r t i c u l w h n t h l y m p h n d i n t h r g n f
t h l f t g s t c v e c l a p p r t b v l e d T h
g t a t o m e n t u m c a n b e s f e l y e l i m i n a t e d a n d
e s s q u i e h a e s u l t e d f o r i t s a b s n c e

O n s h o u l d n o t b e t e m p t e d t o p a l l t i v e s u r
g y f r g a s t r c u l c e r I n a g u p f 3 p t i t s s u b
j e t d t g a s t r o n t r s t m y t h o r v t h t c a u t e
t e a t a f t h l e t h e w e r a v h o d d f
c a n f t h s t o m a c h T h i s s h s t h a t e v n p e
n d u g n s c a n n t e l l b y t h f e l o r t h a p p e a r
n o f g t c l e e h t h i t s b g o r m a
l g a t

T h t h h l e s t h a t e l y r d c a l u r g y
n d c t d v h n p t n t p p e r s f t e a t m e n t i t h
l e f t t o m a c h i n t h p y l o r f u n d a l
g n s I f h e i v o r f o t y y e a r s f g a n d h l a d
s y m p t m s f l e t h a o n e j e a i f s l e r i o v r
2 c m d m e t r t h m d i c s h u l d b e g v e n
I f t h p t e n t i s y g a n d h a s m l l e s o r
f t h e u l c s u p e m p o d n s y m p t o m f m
t h n f i v y d a t o n a m e c o n s r v a t e t t

id ju t n ble This patient sh ld n t be tr ated
an mb latory fash n as s common practice
m l k or l d de fulcer b t sh uld be g n
th b n fit of n adeq t hosp tal r g m If the
ul r r m ns en part ll unh al d aft r
m nth f s h therap if th re is a ctu n of
ulc rat n e m th ft heal n i p pae t then
th pat nt h ld be g d to submit to s gery
J m K N A M D

Schwa t S O L g lty lth M t tati Ca ci
n ma fth Stom cl t I I M 94 277

Th r s cons d rable den e that carc oma of
th t m ch m y m n f t its lf as a d a e of
ma led ch n c t S b e q e n t m e t a t a s e s
(espec lly that f th bo e) h e the d n
rd cour s i t t d to be el t ely rap d F r
th e on perat cpr cedures fo th fl t n f
th pr m ary l e r d t k n th reduct nce
h n m t a s e s a dem n t a b l The auth r
p o t s a c a e w th metastat c a c noma d m n
st ted n the bo ma o th e y a r s b o e d th
t copen s q e s t i o n the v a l d i t y o f e t m e s g i
c a f c o n r v a t m th p r e s e c t m e t a s t a s e s

The patient ginally pr s t d h m s lf with the
histo y f a p e t c u l of n u n e e n y e r s d r a t
h i e h d m a n f e t d t l f b y p a a n d b l e e d g
I t i s i m p o s s i b l e t o a s r t n f m the h t r w h n
th a n s i o n f r m t h b e n g n c d i t n t o m a l g
n a n e y h d t a k n p l s Th o b l g h t l a n t
d a t g h a d m o n b y t h r f o u r m n t h s w t h
f i r s t c l i n i c a l l u e t h a t s i g n i f i c a t c h n g e h d t a k n
p l a c e I t i m p o s s i b l e h e r e t h t t h i w o l d
h a e b e e n s f f e n t m e s o f d e l p m e n t f t h e
m t t a e s The h m a l g a l s d f g o n t h s
a d m i s s i o n e c o m p t b l e w t h c u t b l e d s u p e
i m p o d n c h r n e b l e d t h o u t c a s t i n g f i g h t
n the n a t u o f t h n d e l y n g l e s o n T h b s e
f f e a d d t h p e s e e f b l d i n t h g s t c
c o n t n t s a s w e l l a s t h p e r v a t c u l t h b l o o d i n t h
t o o f a l l s u g g e t d m a l g n c y l t a n h e a t t h a t
n e u t h e r g a s t r o s c o p i c n r o e n t g n g r p h e a m
n a t i o n r e v l e d t h e l e s n e n t h o u g h t s p e s e n c e t
t h i s t i m e w a s c o n f i m d b t h f i n d i n g o f m t a s e s
I t h o n t w o t h y t h a t n b l a n d d e t n d r
p l a c e m e n t t h e r a p y (i r o n) t h b l o o d f i n d i n g s b e c a m e
n o m l w i t h a e l t i v l y h t p e r d f t i m e
T h o g h d e t a i l s i n t h i n t r a l r e n a a b l n
d c a f c h a g e h a d p p a e n t l y t a k p l a c e d r m
t h e t w n d o n e h l f y p e r d b e t t h e
p a t e t s f i r s t h p i t l a d m i s s i o n a n d t h p p e
n f r m m a n t s y m p t m h i c h e c e p t t h o s
d a y t e t n s b o n d t r u t w e a s i m i
l a t o t h o r i g i n a l I t i s m e w h a t s r p u s i n g t h t
t h e b l o o d s l d h m e d e n t n d e q a t l l
n p t o f e p d e s f i b l e d i g d m a r k d a d i s
p l a c e m e n t o f t h b o m r o w a n d s h u l d h e
c o m p l e t e l y l a c k e d t h h r a t i s t e s r d n a r l y
a o c t d w t h m l p h t h c m a s
A f t e r e f c o r d e d t h e c l i n i c a l n t t t h
t r a t n f m t h t n t t h m l g n t c h a r a c
t e r i t c o f t h e l e e r n t r o n o r n a l l y r l i n g

its lf cl cally by t n a b l e e l A t t h t m
t h f e s w a s s m l l (o p l c e d) t b e n l
c o e r a b l b y t h r o e t g r a o g a t o s c o p e
e x a m i n a t n a d y t i t h d a l j m t a s t a z e d t
t h b o n e s s t n s l a s t b e c t l g c a l l y d e m
t r a b l e O f m c h m m p o t n e w t h b e a n
c o r s e f t w n d n h l f a p e r o d f l l
t h d m n t r a t n f b n m a m e t a t a s T h
e s t h q e s t h t h t m s g a l c o r n
t m j j t a d s t h p c f l m t r l l
m t s t a s e s h t h o p t e t r n t
m g h t b e a d c a t d f t h l l a t o f s y m p t m
I t w o l d p p a t l a t f r o m t h n g u l a c a
t h a t p r i m a g a l j o c d u h n o t h r m
u n d c a t e f a e j s t t d n t h o u g h a r l y m t a s t
r e d m n s t a b l J m K N A M D

A p p t b y L H P t p e r a t l S r v i v l P l o d l
G s t r o i n t e s t i n a l C a c i m C d M l
J 94 545

O f 3 S p t n t t h e a m o f t h e r e t u m 4
w e r e o p s t e d a d g f t h e l f t h o p t a l
w t h r a s a b l p p e c t f g e l c e T a l
o n e o f t h 8 2 h d f i c e y e a r s h t m a y
m e a r s t f l a l g t m n v h a g b n o p e
a t d w t h n t h l t e y S v l a r l
a f t t e n y a r s d p a t n t h s v i d i o t e e n
y e a r s a d g l h l t h

O f 3 y c a s f e a r o m o f t h e s g m o d 96 w
x p l d O n h u n d o f t h e s l f t h o p t a l
i t h a p o s p e t f e u F i f t y f r o t h e s p a t t
a r e t l l f e 34 d i t y e a r s m o r a d
m y o f t h e m h l o n

I 8 i c a s f e a c n o m f t h t r r d d
c e n d i n g c f t h e s l t h b e n p o e
S e v t y e n p t t s w p l o r d n d 36 s
i d r s t i n O f t h f t t l y 9 e k n t o h
f i l t f i c y a r s

F i f t y n f 62 c a e s f e a o m o f t h c u m
a n d c e d n g l n e p l d a d 44 w e
e c t d T h t y e a t a n t s k n o w n t b e a l
d o f t h 24 h a r v i v d h y r s m e

A l l 6 c a s e s f p m a r y c a c n m a o f t h s m a l l t a
t n c o p e a t d n T h e t h e t n s r p a t
f t h d n m t a t d b y p a l l i a t e s h t
c i r c u t T h e c i n t h m b l s g m n t s f t h e s m l l
i n t e s t i n e w e r e s t d T o l t h p t n t s a
a l e f t s u x y a r s t h e t h e r a f t e n t e
m o n t h s

O n l y 93 c a e s o f 684 f e a c o m f t h s t m c h
w x p l e d T h o t h e 49 c a s e s f d n o p o s
p e c t f e u r O l y 3 c a s w r e s t d w t h
p o s p e c t f e u r T n t y l f t h p t n t s u
v d T h l g s t p e d f s r v a l g h t n
m o n t h s a d t h a g p e d w a g n t a n d n
h a l f m o t h s A y p e t n j l t i
c a r c i n m l t h e t m a h a s d g T h m o
t a l t y r t n e c t f t h s t o m a h f c a n c e r i s
4 p e c e n t e s t n f l e e r t h c a u s
t i s 3 s p e c t T h i s d f f c e i t h m o t i v
r a t e i n t h h a d s f t h m s e m u s t b e i n
t r a n s t t h e d i s a s a d n t t h e u r g n

In carcinoma of the gastrointestinal tract, the survival of the stomach after resection has a 36 per cent chance of survival for over five years. The results in these figures do not support the use of chemotherapy.

Andersson A C. Slutsky B. and Miller R W. Effect of the gastric secretion of Pepsin on the growth of the stomach wall. *Am J Surg* 1945; 43: 3.

The authors report that the inhibition of gastric secretion by the gastric mucosal reflex through the vagus nerve is a protective mechanism. In the case of the stomach wall, the inhibition of the gastric secretion is not sufficient to prevent the growth of the stomach wall.

The animal used in this study was a dog. The dog was fed a diet of meat and bone. The dog was kept in a cage and was not allowed to exercise. The dog was fed a diet of meat and bone. The dog was kept in a cage and was not allowed to exercise. The dog was fed a diet of meat and bone. The dog was kept in a cage and was not allowed to exercise.

After determining the normal gastric secretion, the authors performed a gastric resection. The dog was kept in a cage and was not allowed to exercise. The dog was fed a diet of meat and bone. The dog was kept in a cage and was not allowed to exercise. The dog was fed a diet of meat and bone. The dog was kept in a cage and was not allowed to exercise.

B. V. J. G. V. M. D.

March 11 S. F. A. P. I. n. f. th. S. r. g. i. c. a. l. M. n. a. g. m. n. t. f. c. t. j. j. u. n. l. l. F. i. t. u. l. a. A. S. z. 945 6

The patient was a male, 35 years of age, who had a long history of gastric trouble. He had been treated with various medications, but with no success. He was admitted to the hospital on March 11, 1945, with a diagnosis of gastric cancer. The patient was operated on on March 11, 1945, and the tumor was removed. The patient was kept in the hospital for 14 days and then discharged.

Gastric jejunocolic fistula is most commonly caused by a penetrating ulcer. The patient was operated on on March 11, 1945, and the tumor was removed. The patient was kept in the hospital for 14 days and then discharged. The patient was operated on on March 11, 1945, and the tumor was removed. The patient was kept in the hospital for 14 days and then discharged.

malnutrition with the alteration in the protein and blood chemistry. The malnutrition is a severe operative procedure and is a severe procedure.

Experience has demonstrated that in order to prevent the occurrence of any complication in the case of a radical subtotal resection of the stomach, the fistula should be closed. In addition, the fistula should be closed by the use of the fistula. The fistula should be closed by the use of the fistula. The fistula should be closed by the use of the fistula. The fistula should be closed by the use of the fistula.

In the case of the fistula, the patient was operated on on March 11, 1945, and the tumor was removed. The patient was kept in the hospital for 14 days and then discharged. The patient was operated on on March 11, 1945, and the tumor was removed. The patient was kept in the hospital for 14 days and then discharged.

All of the patients had a good result. The patient was operated on on March 11, 1945, and the tumor was removed. The patient was kept in the hospital for 14 days and then discharged. The patient was operated on on March 11, 1945, and the tumor was removed. The patient was kept in the hospital for 14 days and then discharged.

G. I. n. r. C. L. D. stu. ban. in the Suga. Met. h. of m. ft. Subtotal G. t. ectomy. Am. J. D. g. t. D. 945 57

The absorption of sugar in the small intestine is a normal process. The patient was operated on on March 11, 1945, and the tumor was removed. The patient was kept in the hospital for 14 days and then discharged. The patient was operated on on March 11, 1945, and the tumor was removed. The patient was kept in the hospital for 14 days and then discharged.

In no instance was the patient able to eat. The patient was operated on on March 11, 1945, and the tumor was removed. The patient was kept in the hospital for 14 days and then discharged. The patient was operated on on March 11, 1945, and the tumor was removed. The patient was kept in the hospital for 14 days and then discharged.

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J R K N MD

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S m J Foc LS MD

Gray I Tr ma In Relati n to P ptic Ulcer
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The a th r t t e that i run tal k
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5 Th b s e q u n t d v e l o p m e n t f d u d e n a l u l e r s f l l n i n f c t i o f t h e b u n e d r e a h a b e n n o t e d b n n y

6 N c h e l n d O l o n n c l d f o m t h e p r m t l l k t h a t c o m p u n d s o f t h e n a t u e o f a c t y l c l o h m a y b e l e t d b y t h b n o t h a t h a t y l c l e s p l t t n g t r a s m a v h i h b i t e d b y t h b r

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T h e a u t o p y e v a l d a p u n c h e d t o n d h o l 5 m m n d a m e t r f s t h a t e s o u p e o a s p e c t o f t h d o d e n u m j s t a b o t a t t h e j u n c t i o I t h p v l s p h c t r a d t d g t h r o g h l c o a t s f t h e n t e t n e T h l e s h o d n i n f l m m a t o n a n d l i t t l d e n e o f f i b o a d c a i g A b u t n c h d t l l y t h e r a a t h r a a i s u p f i c a l c a g w i t h a n i n f l a m m a t y m a g n b o u t 5 m m n d m e t J o e H K N A R t M D

R n l f W F J A n A n a l y s i s f t h R l t f t h S u g c a l T r t n i n t f 260 G n s c u t C e f C h n P p t c U l f t h D u o d n m A J g 945 583

T h i s r e p o t b s d n 6 p t t s p e r t d p o n b y t h a t h s d p e t e t c h q b h w s b d n t a n t m e a n d p h y o l o g c a l o n d e a t n t h t o m b l s l t y n d f c o c y i n a h i g h r d e g r t h n t m o r n r v a t a n d a l t h r m a d c l p r d c A l l f t h e p a g t t w e p r v a t s d t h y w r c n t e d

r y s x m o n t h s t d e t r m i n e t h t h n p e s a t r o n d i t o I n n o n s t a c e d d n y p a t e n t l a t r p o t T h e a t o n a l e o f t h o p a t i e t e c h n q u e w a s

T r e m o v e t h m t c t i p r t o f t h e s t m a c h f o m t h e s t n d p i t f n t r c t l i t y n a m l y t h p l c a t r u m a n d t h f u n d u p t t h i c u a g u l r B y t h i s p r o c e d u r e t h d i s t m l a t a g p o t i o n o f t h e g a s t c m c s a i n t h e p y l r c a n t r u m a s w e l l s f r o m o n t h d t o o h l f f t h a c l s c e t i n g m u c a f t h f i n d u w a s e d T h r m o a l o f t h e m u c i t h p y l o i a t r u m t k e s a w a y t h e g a s t r c h m o n e g t h c h i s a m a j r f a c t r i n t h s t i m u l t o f g a t s e c e t o

T o r e t b l f h t h n t i n t y o f t h g t o i t t a f r c t b y n a t c l g a s t o j e j n o t m v t h a l a g e s t o m a

3 T o n d c f e g a t o f t h r m i g a t c e m e n t w i t h t h a l n e d u o d a l c r t o n b m a s o f t h s P l a y a t p e f a n a t o m a d p d c a m i m m e u t a l i s t o n f t h e g a t i c n t n b

T d e r t h e f l f g a s t r c o t t s f o m t h u l b a i g p o r t n o f t h d u d e u m i n t o t h e j u u m

T h c o r v t e t i n f l l e d b y t h n t e c o f c g a s t r j u o t m y h s a l o w e r m m d t e m t l y a n d i s l i t s n y f t h s r g c a l p r c d u h c h m a y b n c s r y a t h r u l t i p t o p e r a t c m p l c a t o s T h a t h a p p a e n t l y d t b l i t h t i t i s n c s a r y t o p e r f r m d c a l t n e r e s e c t i o n o a l p a t t s w t h p t c l c f t h d u d n m b e c a s a l l b u t a l t l y m a l l p c e n t a g o f t h c a s e a e a t f a c t o r l y t r t d b y c e r v i v r s c t o n w i t h a l w r i m m d a t e m r t l t y

T h p e a t i v t e c h q u o n i s t e d o f m i d l i n e c o n t o l o c a t e t h e c m m n d u c t t s p o t o l d a p p e a c e b h d t h e u p p e p a t f t h e n d p o r t i o n o f t h d o d e n m T h e l f t g s t c e s e l a d t h g i t v a g u n e r v e r d v i d d t h n t h v e s l s i n t h e g a s t r h e p a t c a n d g t o t e l g a m n t s s w l f s t h e d u d n h p a t c n d u d o c o l c l g m e n t s w e d d l y l a m p d a n d l g t e d t h s i l k T h g m e n t f t h e s t m a c h t o b m e d w a s n e x t c l a m p e d w i t h t w P y r c l m p s t h a t h e p y l o i t r u m p y l o c p h u c t e a n d p t o n f t h l a n d t h s t o m c h w e r e m d T h t u m p o f t h d e n u m w a s c l e d w t h t l y s i n f u t r d t h f i r s t t u w s c i

o u s o n e w i t h O c h r m e c a t g u s A f t e r t h e f i r s t u t u r w a s p l a e t h e r u s h d t s t g e t h r t h t h c l a m p w a s e m d T h e c c n d r i f u t u r s w e r e i n t r u p t e d H l s t e d s t o f f i l k h h i r t s t h e f i r s t c o n t n s s u t u l n e A a r u l e t h e y w e e t a t d m d i l l y n d c n t n d l a t e r l l B e c a e o f t h r l a t e l y s m l l m n t f s t o m a c h e m d h o t l p n t c o l c g a t r j e j n t m y u l d b a d l y p f r m e d w i t h o t h c d o f a e t n t o s t m T h i s w a s s h t t h a t a f t s t r f t h e i n t n t t h d f t h s t m c h t h d s t n b e t e t h l g a m t f T t z a d t h b g n g f t h e g a t j u n l a a t o m i t t h l e s c u r a t a n l y t h n b b a d t h

ca s rg ry may j d g d res lts mo c oft
than i g ne ally e l d Am ng surv ors p
t d upon th n s v h urs ther wa a p p d
nce f those ith in ry t the tran erse c fo
he as am ng thos p rated pon in th sec nd
si h u per od th r s a m rk d f l l n th num
be i u f l l wing in ry t th segment
Th is d e pr b bly to the equ cy f se er hem
hagel mth dee p n f ascu l r mes nte y
m c l n a dome tum and fr m j u ry t th r
abdom l o gans Th b tter blo d upply of th
p imal l n and the fr q c c f ther blom
nal in j u r i c a e th sk n j rest th e g
ments wh l the g ate rule c of th c tents of
the descen ling c lo nd th d f f u l t y of m bl z
t n and exte o t n of th l tter nre cas the
r k in w u l f th l f t colo In un mple c t d
o d penet t g the abd men sh k is n n
m s ith ter al hemo h g nd th und d
d n the first f hours f om hem r r h g d h ck
Th ind cat s the f nction of the res sc at on u s
first to m k the ou ded f f p a n b v tr ns
f s o a d c nd t ma ta n l id and alt b l n e
d r i g o lesc c

In r g a d o ope t tr atm nt of th i j red
c lo t r r a i o f the damag d po t n hen
po s bl th s fest p oced Although it is
bette t b r g the gut o t th ugh th k n u
gent ca s w th a h r t l o p th aper to cal at on
may be ch d by sut th i jured c l n to th
par etal per to e m a d l a n th abd m n l
o nd only pat l l s t r d

Wh n the co l d i t f the patie t uch th t th
sk of m b l i zation i t g eat los of th per f r
t i n th t o layers f sut res a d c mplete
clu o f the gment by a p r m al o c st m y the
n t b s t m th d The colost m y m s th a g d
spu a d sh uld b establ sh d a n r th les n a
p ble The sut red a ca h uld h d nd th r
ghlv

Wh n th l ert h d f th j el c olo h be n
njur d a lequate p u e a d utu s d f f i t
that d ag nd p o m l c lo t m y lo e m y
ha e t suffice A g sly bru ed nd d tal z d
a o f b e l h uld al o b t d a ape etrat
E t per tone l per f o r t n of the f i ed p o f
the col n must o t b o r i o k d d h uld b
treated by m b l i zation f o in pe t s u g f
the p fo at on and clo ng f th r a f r m th
p t neal ca it by tu f th b l to th pa
t th th p o o f g d d a g Wh a
la g gm t f l l t b r c t d p i m y
an t m un l d th t lo c t m
h ul t b b ght t d p nd ntl at th m t
c nt te H f t m l o f a h p
l s l j m d ght c l l r l l t m s r
colo t m y h h l th pr l d f th
tran r e l n ope t m n a l c lo t m y m s
be j u t f l e

Th c m p l c a t o f l l ng s p e t e p
cedur nd th cl r f th ol t m y r d
cu s d j o w L L p o c t M D

Ca e l l W S gl I E pe l n c s with Ulcerati
Coliti s g Cl v f er 945 s 3

Th object f th pr t t n first t d s
c t n m p r s i s and e o d t g i e som de
tail d tech c l ugg st as nd w r f the p f l
h h m y t e o n t e d in th treatm nt ful
t v t l t Th tho b s s b s s i a t m e t s h
c p e n c s th g p t i s u p h c h r p
f m e d p a t o These g r i n l d l u d e n t
63 p r t n th 8 death n p e a t m o t a l
t f 95 p c n t

In the first t y r s of th l th re e 15
m e g y p a t o n th cut f l m n a t g s t a
f th d a th 8 d a t h a o p e r t v m t a l t y
f 53 p e t The f t l s s l e d s t h t t h
t y p f c e h u l d n o t h a d r s n f t h f l
t e a m b c a u f the d b l t t i e t o m
h m r h a Lat 5 l o t m s w r e d th
4 d e t h n o p e a t v m t l t y of 8 p e c t l n
d d t o th e r 46 u b t l l o l c t o m th g
d th n o p e r t e m t a l t y of 8 p t g p
t a l c l t m e t h d th a n o p e r a t m r t l t
f r i p e c t a d s l g m d t m e a d i c o m
b i n d a b d m p s l c t w h t f l t
t c t f m p t n t o k t h m e d c a l t r a t m t
h a s p d n a d q t e w h n the p c h s c h d
t h t g of r e r s b l t E a l d e r s o of th
f c a f t r a m h n th d s f the i t h t
w l l p c e d t i t a t a b l t y h l d b e m p l d
m f q u n t l H e i t s d f f l l t d f f r
t a t the t p e of th d i n t p

The i d t o n f e m g v g r i m p e d
p f o t o n M s h m r h g e l l b e t e d
m o e s s f l l y b y th p h y c n th t a n s u
a d n e p s m d e s th n b y th u g e p t e u
l a l y in the c t p h a The e a r t d t e t
g r u p of pat t w h o h u l d m t o s u g a l y
() th h o h a e t e p t h l g l c h a n g e s
a d () th t h m the d e a e h s p o d f
a t t v and r e m i s n b t w h m th t r d
d n d The l t t e t y p a t n c l l b e p a d
p o l g d l l d l f c l n f l e o s t m y
performed t h t a l e s t p h f th d e s p o
d d o e r t th t h d a s s p g s e
n d c n t b e m n g d m d e a l l o s t m y
m h m o r e of s k th n u b t o t l c l t o m y l 6
l s t m s t h r r d th s m t l t y t e f
g p e c t A n a b l f c t th t m a y f t h
p t n t s f o l l o l t m y n d b t o l c l e t m y
h m e d l l t h u t p o t e t m y Th i d l
p l a f t t m t f r a p t e t th a f r d a e d
l e l g h t l n a n d t m f i r s t
a l l t m n d th b t o l c l e c t m y w h
h a l l f t h p t n t h t g n e d s t f t o l y
g h t a l t h p r s t t b l l y d h g
f m t h n m l f t h t m

Th l t m c a b b e s t c a d t t h r g h
M B v th d f t h l u m a p
p m t l 6 h e s f th l c a l l e Th
d t a l d d d b ght t t h o g h a s t a b
w d n th t r r b d m n a l l h e s t e
f o t h m b l d j t t the l f t f the m d l e

The r mald viled nli b ought out of the lo cr
ngle f the McBurney i c n lgre t c e s
e c sed i s turing the cut mes ntery t the peri
tome mon th undersu fac of the ant r or abd m
nal w ll in order t pre ent p lapse f th leal
toma The lum i l sutured t th peritone m
th No oooo pla n catgut n a fine tra matic
needle

The ec nd tag of the s ig caly oced e f the
cur fulcer t e c l t is btol c lctomy Th
means m val f th last 6 nch of th te m af
ileum f th c cum a lo f th a nd ng tran e e
and desce d c l as w lla most of th sgm l
d n t app o im f ly 6 nches above the pe
ton al r flet on Thi d e th gh a l f para
med i c u a f om th l l f the phoid c
til ge d n t d c l d g th j r v u mucous
f fula of the d t l d ided ile m l d w n t 3
n hes bel th s point Th m t d f ficult p t f
s bt tale l t m m l t l at f th spl f x
t e d d i f the pl c l c l g m t \ t
tempt h uld be m d to cl e the d stal d d den l
f th col n and p th ck t th pe it l ca
ity b t the d t l l l l d t ut p r d ut
f th pel th t t p r tr u d s f r m 2 t 3 nches
alo th t e r i b d m n al ll Th l d
v l d s gm d sho l d b t e d t the j e r i t o e u m
and the t r a b d m a l ll t d r t o p r n t
a p ble t t t l t u c t i o n t v a l p f m ll
l el push ng t v th r gh th l w b c l e g
m t l th l t e r a l p e r t l ll
S M J Foc MD

McPh rs A G nd k n m nth J B Acute
Appe d c t l a d e th Appndi M s f t f
S f 945 3 365

Th r t l a n a l 3 e s f a c u t a p p e d
c i t t d n St Th m H o s p i t a l f m 937 t
104 nd m k s c m p i s o n th t i m i l a r
l e s f m th m h p i t a l m a d o a f o r t y
v r p i d P e t u c u l a r t t e n t d w n t a c u t
a p p e n d i t u m f m t Th l t l f
c t t h t r m a p p e d x m i t h l e
t u a f f q u n t l y t c o n f e l t h t h t m
p p l a b e s s B a p p d e r t s w t h m s
t h e a t h m n c l c a l c o d t n w h c h t r
l d t u n t o t h e i g d s y m p t o m f c u t e a p
p n d e t m a s t h i g h t l c f f o s s a h c h i p o l
p a b l t h o t a e s t h e s i m f t h e s m e m a
c t s m p o b c o m e l k a b e s e w h l
t h r s e n t f n s f m d a p p d l l e d o f f b y
f l m l a n d d m t s m n t m m t e r v a n d
c l f b o w l Th a u t h o r s b e l e t h a t t h p e s n
f a m i n d e a t a n a t t m p t o n t h p a t f s p e r
t n m t l c a l z e t h i n f e c t i o n a f t h s t m p t
a p p e r s t b e s c e e d g t h e c a s s t r a t d e r
a t l y Th l n c a l f i d g s t h n t h
l g t h l t h s t r y d e c d t h m a n a g m n t E a l y
c a s e r t t d b y i m m d t p e r a t n n d i v h
t h v d e n c e g g s t g s p d f i f c t n o f
f k d f f p e r i o n t a t t h t m c a d m n
p e a t i a l d T h s c e r v t t t m e t

n t t l e c n f u s e l v t h t h e O c h s n r m e t h o d o f
t r e a t m e n t v h i c h i s a p p l i d t c a s e s w i t h g e n e r a l p
t t s

P a t i e n t s v i t h a m s s a r p u t t o b e d i n l o w F o l
e s p o s i t i o n s d a t i v e e n e m a s o r a p e r i e n t s a r e
a l l o d f f d i n s m a l l a m u n t s o n l y a r g i v e n b y
m o u t h a n d t h e h i f h u r l p u l e r a t i s c h t e l
l d c a t i o n s f a b a n l o n i g c o n s r v a t e t r e a t m e n t
a r e a g p u l e p r s i t e n t l y e l v a t e d p u l e r
r t e n c r e g s g m a n d s y m p t o m s s u g g e t t e
s f e d f n i c t i n b e c f m a t i o n (a t a l a t e
t a g) a n l a n l l y a f a l u r t o r s l y
C o n s e r v a t t r e a t m e n t i n t a d e d f o r c h i l d e n
t h a g l o r n p e g n a c v l e s a r y f m a n d l o c a l
i z e d m s p e c i o n a d m s i o n a n d t h i s u c o m
m n i n t h e t y p e s I n t e r v a l a p p e n d e m t h
m o n t h a f t r l t n f e r m a s r e o m m e n d e
f r t h o e a s e h i c h h a e r p n d e d t o c o n s e r v a
t u e t m e t n l s s a g t h g e n e r a l c o n d t n o f
t h e p a t i e n t i c a n d c a t i o

T h e s r c a s f m p l e a c u t p j u n d c i t s
90 i t h d i f f u e p r i t n i t i s a n d o t h a m s T h
m o r t a l i t y r a t n s m p l a p p e n d c i t s a s r 7 p e r
c e n t n c o t s t t 56 p r c e t i n c a s e s i t h d i f f u e
p e r i t n i t i s O n l y r p a t e t n v h m a m a s h d b e n
f e l t b f e p e r a t i s d i e d h c h g a v e a f i g u r f o 8
p e r c e n t N d e a t h s f l l o d i n t r a l a p p n d e m t y
C o n s r v a t t m e t a s h a n d o n e n 37 c a s e
T h e t m e p e n t i n t h e h s p t a l a g d t e l n d
o x t n t h l a y n s m p l e a p p n d e t t h y a n d t h r e e
t e t h s d a y s g n e a l p e r t i s a n d t h t y t w n d
e t t h d 35 f o t h m s c a r t r n i n g f o
t l p p e n d e t m y I t s s g f i c a n t t h a t a l t h u g h
a l n g r h p t l t a v q i r d t h m a s c a s
n l y i t h e e p a t i l l a n d t h s d e t h l l l o e d
p e t n f a p p d e a l a b s c e s T h l e s t m o r t
l i t y o c c u l t h m a s c a s d e s i g n e f c t t h a t
t h a r a g h t o r y l o n g f a c t o r h c h w a s
b l d t o s t h m o r t a l i t y T h e p c n t a g o f
f t l c m p l e t n a l s m a l l s t i n t h m s s
c a T h m t l t y a t e f o r t h e n t e s i e s f 730
c a s e s a m u d t d 91 r e e t

Jo v L Lr q sr MD

45 k T B n d F r i F M Appndi l t t Th
P o s i b l E f f e c t f s f n a m i d e n M o t l i t y
t S g 945 7

T h e a u t h r s r p o t o f t y r s f e x p e r i e n c i t h
a t e p p e d t a m n c p a l i n s t i t u t n f r
t l s h u n f e l d f i f t y o p a t e n t v e
p e t e l p a l n g t h e f t y e a r p r i o d n d
t h u t t h e o t f t h e l f o m l e s w h n
p e f a n h a d c r d D g t h e l e q u t
f y e a r p e o d 500 p a t e n t s w e p e t e d p o
a n d l f m l e a d m n s t e d t o p c a l l y a t t h e
t m e f p e a t i o n f p e f o r a t i o n e x t d F o l l o w i n g
t h p e r a t n s l i a t h a l w a s g n o a l l y i n n r l y
f f f u c f a c e s T h m t a l i t y a t e w l o w e r i n t h
l t t g r p

F t h e c l c a l n d x p r a m e n t l s t d s e n e c
a r y m d e r t o d e t m i n t h e v a l e f t h e s e
o b e r t J G r e M D

Holland C A Multipl Ca inomas J Am M
t 945 S 356

Multipl prim ry malign nt growths sh uld now
rot b ons d r p th logical cu os tes and r
ma kably a b cau e th ir ne denc va es from
334 t 433 p c nt Th ca ported p esent a
ca n ma of the b ca t m A g u t 933 and a car
c m of the esophagus in J n 039 t hich time
th pat ent l o h da mall basal c lica c n ma fth
l ft h k In J ne 942 an nn l r car nom of
th h p t c f l xure was fo nd nd atp ent t nty
gh t m th afte th r m al of th f u th ca i
nom th p t n t i th o t phys clor r t g n
ev d nc fa y m l g a t f e a

S L E J FOGG SO M D

LIVER GALL BLADDER PANCREAS AND SPLEEN

K l y M P nd C m f t M W O c l i n of
th H p t i V i s A R v w f 20 Cases d h
f t M 94 7 7

Oc lu n f th h p t c s a ac d ntal
f nd ng n 16 f the 2 c s p t d b y the authors
n the rem n ng 4 it play d majo role n th l l e s
The cel i n n l l e a d e t o th m b o s O
cl s ion of the h p a t c in may b prim r
secondary to n l l a m m a t v e r h t i c or n o p l s t c
di e a s e f th l t t h o m b o s of the n i g h b o
i n g v e n c a a t d a s e s n h c h t h o m b o s c u r s
f e q n t l c h p o l y c y t h m a n a and perhaps
the s l w i n g f the c i r c l a t i o n d e b i l i t a n g d e a e
While i t s e m e r l a n e d e n t a l o b r a t i o n t
a u t p s y i t h o l d b p e t d w h e n a n a c t e p i
f l e p u s d i t h s h c k c u r s d u n g a n o t h r i e
c h r n c o r e f h e t c d e a s

In cases of acute c l s n f th h p t c e n s a
w e l l a i n a c u t e t r m a l p s o d e s f t h e h o n f m
of the d e s t h r a p d t y f n e i n t h e o f
th e l e r t h r i t h e d n o p f i n d d s t u r
b n e s of h e p a t c f u n c t i o n and f p o l a b s t r u c t i o n
(h c h c u l d b c a u s e d o n l y b y s m r p d l y d e v e l
o p i n g p o s s u c h a s t h r m b o s) m y w l l s u g g t
the c o r r e t d a g o

Acute c l s i f th h p a t c n h a h e n c o n
f u e d w t h a c u t e p n e r a t b t o m a l s e r u m a n y
l e s f i n d i n g s l n g w t h a p d l y n l s g l e r a n d
t h r a p d d e v l p m e t o f p r t l o b t r u c t i o n r u l o t
t h e p a c r e t c l e s o n E A R O L T I M E R M D

Aspray M Calcified H mang m s f th L J
Am J R t g 1945 53 446

Th auth r r p r t a c f c a l c i f d h e m n g
o m a s f t h e l e n w h h n r e t g e n e m n a t n
of the abd m x t e r u m b d c a l c i f d
s h a d o w w d m n t t d n t h r g n of th gall
b l d d r W i t h i n t h r u m b d a s t r a k s of
c a l c i f i c a t i o n s e m e d t o a d t u f o m t h c e n t r
T h i m p e s o n w a t h a t o f a b n g e p l t i
v o l e m n t of th l v e r p b l v h m a n g m A u
t p s y f d n g s l a t r e f i m d t h d g i s
E A R O L T I M E R M D

Smith B C Acut Ch l e c y t i t i s The S r g e a l
T r a t m e n t f 332 Cas s S t C l \ A m e r i c
945 S 85

The autho has r e e d 33 c a s e s f c u t e
c h l c y t i t i s The r a t i o f f e m a l e s t o m a l e s t
C h l c y s t o m y w s p e r f m e d o n 3 p a
t e t s w t h a m o l t a r y r t e of 35 p e r n t and
c h l e c y t s t m y w a p e f r m d o n 3 p a t e n t s
t h i r m o r t a l i t y a t o f s 6 p e r c n t T o h d e d
a d t h r t y n e e p t e t (70 p e e t) e o b
r v d f a p e r o d r a n g n g f r m n d y t f i
w e e k s a f t e r a d m s o n b e f o o p e r a t i n 4 f t h s
d e d w h c h g a v e a 10 p e r c t m t l i t y r t e
N i n e t y t o c a s e s (30 p e r c n t) w e c o p e a t d u p n
o f the d a y of a d m s n w i t h m o l t a l i t y a t f 54
p e r c e n t C u l t u r e s w e r t a k e n 28 c a s e s p e r
c e n t w e r e r e p r t d s p e s n t n g g r t h t h
b a c i l l u s c l i a s f o n l y 7 t i m e s t h e s t p t c c
v d a n s 23 t i m e s t h e b a c i l l u s e l c h t i m e t h e
h e m o l y t i c t r e p t o c o c c 5 t i m e s t h e t a p h y l o c c u s
a u s 7 t i m e s t h p e m o c c u s 3 t i m e s t h e
h m l y t e b a c i l l u b t l 8 t i m e s n i t h t p h d
b a c i l l 7 t i m e s

The e r e d d a t h s a m t l i t y t f y p e r
c n t O e d a t h o c c u r e d v t h u t p t i n T n t y
d a t h c c u e d e n p a t i n t s o f f i t y f f g
T w t y p e c e t f t h p t e n t h a d e t h g a n g
o p e f o a t n o p e f i t i o n w t h a b s c e S e v e n
p t n t s d d f a c u t p u l m n y c m p l e a t i n s
n d 5 w t h r d a c d w i t h n a l m p l e a t n s
O e p t n t d i d o f a s e p s d u e (a c d g t t h
u t h r) t a n a f c t i o n f t h e o p e r a t i e f i l d h h
h d b e n c a u d b y l a m p t h a d l p p d o f f t h
c u t c y t e d e t T w o p t e n t s d e d f p l m y
m b l and p a t e n t i e d t h s c o m p l e a t n
O n e d d o f a p p l x y d p t n t s c u m b d t
h y p e r

F e c a t d p u l e l u o y t s a t n d e m n
t h r i g h t p p q a d t a d m u t l e p m
d a t a s f o u c h t i m e n t a s i t t t t h
t h e p a t e n t o d t n O n e p t n t m h t
h c n t n t w t h h l v t s t m y a s l f s a g
m S o n d y h l c y t o m y h o l d b e
l n a s o o n a t h p a t e t c d i o n p m t
A d a c d d e s l h e n t h e b o d y m a y c e s
s e t t a c p t u e f c h o l y s t o m s t h e o l y
s g a l t h p y o b l

I f t h l i n e a l o r s o f t h p t n t d o e t m
p o n t e l e h u g e r y r m o r r g d m d c a l
i g l s n d a t d F a l t i m p n t n t y
f h s c a l l f u g a l n t r e n t o I m p o e
m t n d e m d a l m n g m e n t p e m t t h d
l v o f s g v E A R O L T I M E R M D

McGuig n W J Acut Ch l c y s t i t i s A C o m p r a
t l S t u d y of t h M o t l y R a t a f t r i m m e d i
a t e n d D l a y d O p e r a t i n A m J S g 945
68 9

O e h n d r d a d t e t y t h r p t n t s t h a c u t
c h o l s t i t h h e m e t o p e r a t i o n t h e H a z l t
S t t H p t l f H z i t n P n s y l a n d g t h
p a t d c a d e T h e w e 98 f e m l e s d 5 m l e s

th rages anied fom t nty on to se nty years
the a e age ag bei g forty s x and on h lf 3 ars
All cei edes ent allv th ame preope att e t eat
m nt morph ne hypoderm cally n c cap t the
abdomen a d parental inf n of gl coe e so
luti ns to c mb t d byd t n and fort ly the liver
The postoperati e manag me t fall w s also m
slar m phne for p n nd gl cos s luti ns to
ma ntain th wate balance and to supply sug to
the l r

lo th pu pos of c mpa at ve t dy ths m t al
was di d d into groups cc dng t the lngth
f t m el ps gb tw e th on et f th sympt ms
and th oper t n gr up I mpr ing those c m g
to ope t n with f rty eight h rs aft r the s t
f th tt k gro p II those comi g t op rati n
b t en fo t v ght an l e ty t o hours gr up
II f b tw nse e ty t v and nety s hours g p
f b tw n nety and one hundred t cnty
hours g o p v b t een hu dred twenty h urs
and seven d s and group I between ght and ten
days These g ps c mpr ed respect uly 17
20 4 3 and 17 p tie ts Se nty t o ho rs was
arb t uly hosen a the di di g po t t t n the
immed ate pe at n (withn se enty tw h urs)
an l the del yed p d (aft rs v nty two h rs)

Under the e co d to the p t mortality of
th first t o groups that upt e e t h hours
was 36 p e nt nd r r 8 p e nt r pect I r
an av rag p re ntage f 27 for th rem g
gr ps th r spect v pe ce tag e 5 42 and
ag a g f 38 p e nt f th f ur
g p Th t l t t e fo the t e e s f
ca as 56 p e ce t ate h ch comp res f o
ally th ther t t ties n th l t at

B ca e f th educt n m talt t s no th
pol y f the H zelton State Hosp t l t t eat ac t
ch l cyst e p e ctantly a d hen the del y es l t
in mp ement of th c d tion of the p t e t
ch l cyste my p r f rred to h l e cyst tomy and
s em t be better b rne than th less r al cal oper
ati n v h n t i perfo m d imm d at ly II w v r
th policy a s le ble on f th p ges n l
symptoms d signs th t s f th s d l
p ges on f i f c t as sh n by inc g f
the l cyst count the puls ate d c e
l e f the t dera togeth w th m cle p m
th pect t r t m t i nt rrupted d the op
t n p r ferably ch l cyst t t m v p e f m d
Ch l cystost my now us d l i ged nd id
l whose c d t n s uch th t m e e t s
pe at p o c d re i s c tra d e at d th b
f ag a d deb l ty al

J t W B M D

Sch k J R d Col m F C Ch l t h t st
G t l l g y 945 4 344

ch k a d C l m p l c e n d th h
t r s f h t f l e p t n t g d th t h
s f f g r m l l t t A ch l c t t m
p a f m d d th g l l l d d f n d t
t n 363 9 t es Th unt a m d b v n p e

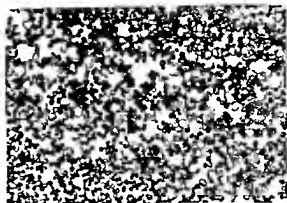


Fig Photograph of m l l p o t f th t f d
th g l l b d d N t th t l l f th m l l i
f c t e d (X)

son a t d t as stant Juring h e se t the
Lous ana St te U v t y Sch l f M l c n Tle
to e e d d d into mall g u j lo l v n
g up was co t d t a t m e a l

B N JAMIN GO MAN M D

Catt H R B P ncre tod od n l R ect l n v
E d J M 945 3 5

E ghtee p t i e n t e u b m t t e d to
d d n a l r e c t n at the Lah y C l c t l n a l l
t i n a l p a t n t s h a d a f i t s t a g e o p e r t i n a d a
second ope t i o n w p l n n e l On p a t e t e f u l
a s e c n d p r o d u a n t h r c i d e r d t o
p o a r s k t w t h t d t n l t l l a n o t l e n t
o p e t e d p o n f u t h e r b c u s e h p e s t e d v s l
r e s e m b l i n g h e m a n g o m a s t h g h u t h p a t i v
f i e l d T p a t n t s e f u d n o p b l e b c a
f m t a s t a e s t p t i e n t h a d l e m e n t f t h
p m e e n t e i c v s l d i h l t e n g
t u m o t h a t c o u l d b e m d l o c a l l y f r m t h
a m p u l l a I n a d d t n 3 p a t n t s e e e x p l t
t h c n d t g e n d a f t r t h p c r e a s s f r l n o
t m f d a n d t h p e r t i o n s d c n t u d
t h e c 3 m n l 5 o m n w h d r e n t h
c m p l e t e d o f t d l y 2 f t h e m e
t t e n s o f t a d f e t f i e f g

The p s n t g y m p t m t 6 a e a s j u n l c
d n 2 e m i a o f e p l a e d o r g O h
p t i n s d d n o h a v a i g h t l O e j a t t h
r m a n d l l f t o v e a 5 f o r h t n m t h
f e r a y a d 3 a e m g l e d t n h a v g t
p e a t d p o n t h n t h e j a t a l i v p a t e t
h d a n t a g p c t o l d e n a l e t i o n u h
l t h t e t t g g o c d r v e m p l o y d i n 3
t n t s t h d a t h a m t l t y t e f l
c n t T o p a t e n t s h d e l e t q t t l a g
t h e h p t l i g h t n l t n m t h f l l i g p
t i o n e s p e t i v l

Th u t h h r f l d e s c r i b e s h p t i t c h
q Th p r t l a r p o n t s d a l t o n
f t h p a a d d d n m s d a l t d t
f t h e p e b l b e f o t h s t m a c h i l l

and the authors meth d of t a plant g th pan
eatic duct in th jej num All an stamo es ar
nticolic E O L ruzr MD

MISCELLANEOUS

Dixon J L M t n G nd O h n A T at
m nt of Abdomin l Inj ri Re ie of 89
Pers n i C s A J S g 945 63 43

In fo m r m ny bdom n lny r con
der d hopes but at pr t mor ff ent
m th d ftr n portati n and the crati n of spe
cal urgic lunt lo th ca f b d m n l ny
ha mad th utl ok m ef al l

If hock r i pe d g h o k i e n t t t t
ment h uld be the p m y n d at n Fr m
to / g f m ph i g n ub t ne l o
gr i i j ct d into th e n In th abe e of
head nd h t njure the fo t fth bed el at d
a n h a d s p r e n t giu s in no mal a l n
lut n i g n immediately f llo d by pl ma
r bl od Aden l e r t cal h mon (75- oo d g
n s) g en i r v n u ly ha be comm d d
by s ne but t val has been d p ted Exc ive
v a m i g of th pate t d r t r mental b t chill g
must b p nt d th cfr pat t a e o eed
v th blanket O y g n sh uld b e en by m ns of
a na al cath ter or th Do thby m sh to p t
ano ia The pul e and bl d p es ure h uld b re
c rded at l t r y f i e m u t s

Latent can be d d d into thre t p () pa
tents who r sp d ell t shock t r tm nt d
sho tabilizati n f th bl od pres ure nd pul
r te f r f r m o e t o h u r s - these m v b
e at d upo i f e pl at on d cat d (2) p t e t
re pond ng t t tment of sho k nly fo a h r t
prod of t m nd th n r lap ing - the s ggest the
pr enc of intra bd m n al h m h g d s b l d
b op ated up at onc in o d t c n t l b l d
ng f rth r blo d tran fu on w l b neces ary
(3) pat nt hod o t r po d t ad quate sho k
th r py but e t u in p f nd l l f r the s a e
hopele s ca es nd surg ry m v nly hasten d ath
how r h h e surg v m y o ca lly p
l f e av ng

A d s D g s Th m unt f b l d lo
best timated by th rum p t e n d m t on
nd by the f l l g d op m thod of B r bou
Ham l t n t g the th h mato r t ead g Th
leu ocyte c unt f l t l l u n l y s may in
d cate bladd j r i d x r y e am at n with
s dum odide i t l l to c t o s c p v n a y b
n c s y A e t l m t t h l d b d e t
l t m e the p s n of b l d i t h t m

R ntg n gams ar f d gn t c l e t f r
m a f e g in p r f o t g w u d f th bd me
th c p o i t o f th p t n t f the at p
t i o r o e n t g n o g a m s d b l b t n the p e n e
f hock th nte opo t r o t g n a m th the
pat nt n left late l d e b t p f b l Ab
s f de the d phr gm nd th right
c t l m g i t c t l d t p d d p e

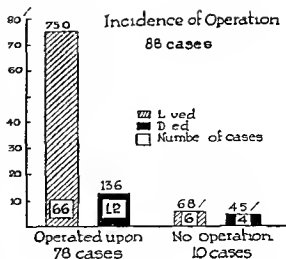
f r t p e lly h n th inju y l e s n t l
th t mach l n l r t n eal p i t than
8 gaug sp l n e d l m v i l l blood o f call
ontam nat d p r t o f l f d nd th rly the
dagn f a r p t u e d cu Ho v negati e
results i e r a l n t g e l u d post f i g s
at anothe po t

P t i s t q s g o p e a l i Thos
hom hock i c n t r l l d a d th n y v couf d
to the l ub t a c with p b l t y f n r y
to the gall bl d d e r x t r h p t i b l du t s Bl d
ng f m the l i e s all r p nd to con r v at
tr tm nt a l p a k n g o s u t u n of the j s
nly l y n e a r y Th e th n p e n t t
g und c n t n d to th abd m n al all a d
a ated th con d r b l blu t r u m 3 Thos
th p e n t t i g u d s m d th m l l h p
trument u h a n c e p c k o th mult pl
b r d h t d S n m a l l b e l p r f to
a l th t i k g e o l e r f u l b r v a t n
with c n s r at th apy und ted 4 Th
with j r e s o f f g d u a t i o n n d b y d at m cal
d i f n t n l p Ho e h the i
o b l d u b t n p l a t o y o p e a t o sh uld b
t d t

P t i s d f i l y r q g p a l i Thos n
hom sh k o t n u e f r f r m t n d n
half h r s d p t o dequat hock the ap a blood
transfu n s n the ca s n t a b d m a l h m
r h a g s s all p t and must be t l l d a
blo d t r a l n m s t b e o t u d Those
ith bd m a l l l w o n d s ith p t f th
t n g u t o r o m n t u m 3 Th th d e f n t e d
d c f p e f a t i n f a h l l w u u g g t d
b y m i n g f b l o d b l o d v t o o l o s g n a f
p e t t t 4 Th th a g a b d m l
p i and r g i t 5 Th with y d e l
a n d e th d a p h g m 6 Th s th a i c a
ng pul ate th p n e f q u e t n b l e
d n c e f t a b d m n a l j r y 7 Th s ith
k d e j n j h e n the s d c f e r e
r t r p n t n l h m o h g e m f e s t d b l g n g
f the f l k p a h e m t n d n e r e n g h c k
8 Th th a j u v t th b l d r d t n d b y
h m t r c y s t g p h y c v t o s p y

F p r a n e the t m d a t m r p h n (/ t t
gr) ith p l a m (/ o o t 50 g) p c f r
n e t t p l e m m n d e d f h r th s d
n u t f i t u n t t n h o l d th b g i f
t o d h d b n g n g e s u l v a b o s t r d o r i
e a y l n th p s n f s r e n t m n a t n
p l y l n t g a b c l l n t t r c m m d e d
Th th t h l d l l q t p t h g t
g t n m p l t e l d m a l e l t n d
a p d t n f i t g v E a h l
e n e n d t o f l l b th n d v g n l p
t o g o p t l e l v g n n e t t o c y l
p p a a d v g l l o f m 6 t 7 p c t
g e n o n t n s p n a l a e s t h e h l d b
u d l y h the s d f h c k r m
p e d g h k n t d e n t r o m m n d e d
b c a t d o e s n t l l s f f i t g e n a t o

la t n l t thal is n t an an thetic fch
 becau e f fr que t laryng al p n n
 a d ne mplet laxatio nd difficult cont ol
 shock When it s used oxygen sho ld b g en
 s multa sly In 7500 cases of pentothal a es
 th s a in the A m v ersea th d ath rat at
 trib tabl t pent th l a ported to be v tim
 higher th that fr m ll oth an sth t ag nt
 comb nd A local an sth tic ma beu ed for m ll
 n pe t at ng wou d Th nd should l
 scrubbed th s ap and ster fo te m utes Th
 l ng tud nal p med n nc n all s better x
 pl at n and m y be e tended t an L o T
 h p Th bl d filled abdom n l cav ty sho ll be
 emptied by ct euf s n f th blood ec
 m mended only if no othe blood pl m a a ail
 abl l rst a s arch f r bleed ng pnts sh uld be
 mad fh pl at n sh ld b mad cc d g t
 the te f th t e nal wounds Injur d vess l
 m y be found in the root of th mesent y f me
 tum and h morrhag may b st pped by dg tal
 pressur and s b q nt lgt n Befo e th ab d
 m n cl sed c reful search sho ld b m d to
 d t m he the blood s pply t the bo els
 was ot i terf rd th b lgt n when th s has
 b the ca adeq t ection vill ha t be
 m de P forat n of the pancr as m y eq re
 m tr ss t e r a mac t d pl of l l tal
 m cl pack g La r ds onl f bl d g
 p fus ly ed te am nt f um larnat Bleed
 g fr m the pl n us lly r qu s pl ect m y
 Th s fill ed by s y t m a t c plo to f p
 f at n b gnn ng n the m dle of the tran rse
 c lon a d e tend g to b th s des to th e cum d
 ctum The sm l l t t best h ked f m
 th Tr t l gam t d n l th n th tomach
 a d d d m clud ng their p st su fa s
 m t b u aliz d Whe r p t ng f the
 b el p e rat n j p rs impos s ble e cct n m y
 b nec s y h ever n th p e enc f h k a
 do ble ba ell d ter t my col t my f th
 A l l es type s p e f ble
 P f at g bl d d r junes sho ld b t e d by
 cy to t my d cl u f th p r f rat fr m th
 ins de f th bladder a d ns ton f u r ap b
 th t th pa of Retz us m y al be d a d
 Local impla t t n f l f mid ca s c
 i d t n and u doubt dlv t fe s w th
 v and h l g the el yst m e adm trat n i
 p fer d No traper to eal d ain el b t a
 d in pl ced thr gh th und d nt the
 pe it m top ent rupt f an at nt the
 pert l ca ty C tton is p e f d for d
 l ue but w may b us d f ap d lo th
 th ugh d th ugh ut es
 lost pe t ca clud m eph (g)
 ery f r h s W ge t en u n th th
 L in o Mill Abb t t b a he t t nt th
 b l m n th T ndel b rg post n t l th pa
 t t k f m thes th F l r po
 t a ch g f th p t po t h
 c rag m nt f deep b ath g and gh ng



Fg G phic p t u f d f l p t
 my d m t lty th se (C tesy f th
 Am c J l f S g y)

ooo c. of 5 per cent glucose and 1000 c c f
 gl co e in sal solution th in outp t sho ld
 b at lea t 500 c c bl d tran fus and plasm
 or am ac d sho ld b g accord g t th
 findi gs Sod m ulfad a e (2 gm ntrav n u ly)
 sho ld be g en th times daly to ach a blood
 le l ff m 8 t om gm pe t v t m i C (300
 mgm) itam B (60 m m) l n c (5 mgm)
 gve daly e r e m m end O y gen s g n t
 p ev nt o em a a d to a d b o r p t n o f n t gen
 f m th gast te tnal ct Suct n i c n t u d
 unt l the il u ub id s d act e j r stal i can be
 h a d th the steth c p e posit p y lo c bal
 ce (Ba tlett) fund and g sp ed by ectum
 then f d g is um d g aduall ta t g ith fat
 fre b th and plaint

P t p t c p l t At l c t as dev l ps
 ap d l th tw ty f u hours tratment con
 s t i cou ag g pecto at n a d asp t n
 th th l th t f eces ry by b n
 cho c py

Tr tm t f th mb phlet includes laly
 l mba ympathet block cl ation of the leg and
 th u l elast e and ges nd he t Ligation f the
 fm l en rs d for r e v th l
 purat th mb phl t t is p y phl bit H
 m m d t f m al l g t n h ld t h
 l v y phl both mb s s c n f m d by phle
 b g aphy l e r t n t m y f q e tly l caliz n
 th l d e s c which m y e qu e c e n and d a i
 g th o gh th ant r tal all v ub dia
 ph agmat c f ction u u lly eq r co erv ty
 the apy but if a l e c s d el p dra g sh ul l
 b don by th tr per t n l app ch ith e s c
 t of the t elth r ght r l b

Th f u patient h died w thout perat
 e pract call m sbu d at th t m f l m

GYNECOLOGY

UTERUS

Ab banel A R Th Spa molytic Acti n o l M g
n lum ions on th T tanically Contracting
H man Gra ld Uterus Am J Ob t 945 49 473

Th m g e s m i n has b n graphically d m n
t ted t r t an i m m d i t e p smolytic effect
upon th t t n cally c ntracting human gra d
uteru Mag esium abol h d t a i d ced by
the f llo ing oxytocic ag nt posterior lobe p tui
tary h rmon — h l ext act (p t i t) p fied
y t e c fract (p t cin) p nified opres
or fraction (pitressin) quinn erg n v n and me
therg n (a synth t c g n v n l e s b stance)
Sat sfactory r s lts we e b t i e d b the intra e
n s admini t tio of eith r a c c f a p e c n t
s luti n of m gnes m sulfate c c of a 20 per
ce t olution f magnes m g l co ate Magnes um
probably acts d e c t i v n the m v m t m s l i g
the rad f the c ntr ction a e

Rad d ute ine t i m m y be p e n t d by the
pr phylactic intrav s dmin strat n f m g e s
s i m s lts from th e to fiv m n u t s fte adm n s
tration of th y t e c ag t

Pos terior l be p i t u r y h m o e s h l d n t h e
g e m a dose e c d i n g I U that s o i c c o r
g m i m s and sho ld be meas d t i n a tub r
cul y t n g e

M g n s y m j o n h n o d m o t a b l f i c t p o n
the p t t n of ut ine m t l y i n the first st g e of
labor l t does h w e v e r t a d f t a n a l g c
effect as f as the p t i n s e o n e n e d

C l e u m i o n has l t t l e n o v a l u e a p a s m y t i c
g t u p o n i n d e c u t e i e t e t a n y
C l i n c a l u s e of th a n t i p m o d e p r o p e t e s of the
m g n e s i u m j o n h a c c o m p l i s h e d the f l l i g

I m m e d i a t e r l a t i n of o x y t c e u n d c d
u t r e t s y

D i n g i n d c t i o n f l b m n a g m n t
of second g r e e u t i n i e t i a

I n the third st g f l a b f o r a s e p a t e d
r c a r c a t e d p l c e n t a

B P r e e n t e d u e t t v f l l w i n g the u e of
o x y t c i c s

C R l i e f of f t p r a

D A l l e r a t i o n of e e n t l s p m o d c d y s m e n o r
r h e a

E R e l x t n f B n d i s i n g

F R e l a t i o n of t e t m e l l i c t a c t d u t r u i n
b r u p t p l c t a e

EDWA RD L. COR. TILL, M D

C h m a n B Z H y t r e c t o m y w i t h P r e s e r v a t i o n f
O v a r i n T i u i n th T r e a t m e n t of E n d m
t r i o s i Am J Ob t 945 49 484

Th s r y m e l d s 27 c a s e s f b v t c t o m y
The l a r g e s t n u m b e r f c a s e s (79 p e c n t) c u e d
i p a t t b t e e n t n t y f i n d f o t i v y a

of ag Of 26 patients ho were less th n t e n t y
f i e y e s f a g o h a d c h o c o l a t e c y s t s of the o v a r y
and 6 h a d e n d o m e t r i o m a s n o l d a b d o m i n a l s c a r s
The o t h e r s h d e n d o m e t r i o m a l i m p l a n t s o n the p e i t o
u m o r s a c r o u t e r i n e l i g a m e n t s There w e r e p a
t i e n t s b e t e e n f i f t y a n d s i x t y y e a r s of a g 3 of t h e m
w e r e s t i l l m a r r i a g e d a n d t h e s e h a d a d e n o m y o s i s
o r a d e n o m y o m s of the u t e r u s The m a i n a g e 7
w e r e p a s t t h m e n o p a u s e a n d the o p e r a t i o n s w e r e
d o n e f o r o t h e r c o n d i t i o n s (o v a r i a n c y s t s [m a l i g n a n t
a n d b n g n] p r l a p s u t e a n d s g n u l o s a c e l l
t m o f the o v a r y) a n d l o c a l z e d a d e n o m y o s i s of
the u t e r u s a s f o l d

O n e h u n d r e d a n d n i n e t y f o u r p a t i e n t s e r e m a r r i e d a n d 137 o r 70.6 p e c e n t g a v e a h s t r y f
p g c y O e h u n d r e d a n d t w e n t y e i g h t o r 66
p e r c e n t h a d c h i l d e n a n d the 9 o t h e r s h a d h a d m i
c a r r i a g e s S e e n t y s e v e n w e s i g l e

E i g h t y n a n h a d f i b o m y o m a s a n d 19 h a d a d e n o m y o m a s r a n i n c i d e n c e of 39.8 p e c e n t of m y m s
C h o c o l a t e c y s t s w e p r e s e n t i n 73 c a s e s

C o e r v a t e o p e r a t i o n s (r e m o v a l of o n e o r y
a n d / e c t o m y of the o v a r i e s t h o u g h t h y s t r y
c t m y) w e r e d o n e i n 16.8 p e r c e n t of the c a s e s i n the
y o u n g e r g r o u p s w h e n t h e d i c a s e w a s n o t a d v a n c e d

R m l of a l l o a r i a n t i s s u e w i t h r w o u t
h y s t e c t o m y w s d o n e i n 39 c a s e s a n d d r u m s
u s e d i n 5 a n i n c i d e n c e of 23.4 p e c e n t of o v a n
a b l a t n

I n the f l l w u p s e r e s t h e r e w e r e 17 c a s e s i n
w h i c h a t o p e r a t i o n d f n i t e m o d l s w r f o u n d i n
the w a l l of the r e c t o g i n d b i n g i n the b o w l to
the p o t e r i o r s f c e of the c e r v i a d u t e r u s

H y s t e r e c t m y w i t h c o e r v a t n o f s m e o v a n
t i s s u e w a s d o n e i n 85 c a s e s o 54.8 p e r c e n t a d i n
9 c a s e s the u t r u s l o n e w s r e m e d

I n y u n g w o m e n the s u r g i c a l t e a t m e n t of r e g
n i z e d e d o m t i o s s h o u l d b e p o t p o n e d a s l o g a s
p o s s i b l e a n d the d e c i s i o n f e r a t n s h l d b d e
t e r m i n e d b y the s e r i t y of the s y m p t m a n d the
t e n t of the d i s e a s e

I n e n d o m e t r i o s i s u n r e c o g n i z e d b e f o r l a p o t
o m y c n s e r v a t i o n s g i n c a l m e a s u r e s h o u l d b e u s e l
w h e n t h e r e i s p o s s i b l y f i f t h e p e g n a n c y a n d
w h e n the s y m p t o m s r e c e r e the t e n t a n d l o c a
t i o n f the l e s i o n s e a l o d e t e r m i n i n g f a c t o r s

T a l a b i a t i o n of the o a r e s i n the s u g c a l t e a t
m e n t f e n d o m e t r i o s i w o m e n i the m a s t r u l l i f e
i n o t e c e s s a r y f o r the r l i e f of t h c o n d i t i o n a n d
the p e c u p i t a t e m e n p a u i n o t d e s i r e d

R m o v a l of the t e r u s w i t h p e r s e r v a t i o n f n
i n v o l e d r a n t u e i e f f e c t e a n d p r e v n t s a
p e c p t a t e m n o p a s e EDWA RD L. COR. TILL, M D

M i g J Y The W r t h e l m O p e r a t i o n I r c r i n o
m f the C e r v i x i m J Ob t 945 49 54

Th e n s n o p o s t o p e r a t i o n m o r t a l i t y n t h s
g r o p f 65 p a t n t s w h o w e r e s b j e t d t t h e

W rth m perat n f ca ci om of the
Thi result is f maj imp tance f ith the v
ll t ults btained ith ad m and ray
t atm t n c uld da e rt g ry if the
m tal ty h gh The e figu e p e th t su
g v can be don s fly nd ther f it ppro
p t th t u gual t tm t ho ld h lated
by t i al ges of ca The fa h gh
m t lty h ld n l ger be a l t e t t th
g cal t eatm t f l e t d c e f r cal can

Of 6 pat ts 5 (7 p c t) k o t b
d d d 3 f th had p t l mph n ds
Of th 53 pat nts h d d n th p tiv d s
ly de da r v l at f 963 per t Of
th tot l f 65 p t cent 5 e d h e r ent
d seas nd w l st whic h es t tal p ob
able l f 3 p r nt a d c cted al
figure f 87 p cent

It op p ble t comp e th e fig th
k o fi ve r lts foll g th e of d m
but f th goup f p t ts ar l e f e y ar
ol s f f y e le of th r y e o
l s r f t v ar s o le nd f r e y a
less Undoubt dly m lld b t judg g i m
th r l t a d e c ng the pat t m follo up
l ies the auth pr d ts th t the l t mat lts
f th s f e y a eries w ll be mo s t fact ry than
those n m l gr p t at d w th rad m
dum plus y th py

No eo r lat n eo l d b m d of the 8 p t nts
h d d l t e l ng th d e a
th e t nt f th d s a g d f the can c Th
d ad o d ng e too f w to ttempt y statist cal
den Th ce who d d had p t lymph de
hich p h p a s g f e a n t f c t
Surg l e mo val f the ea ly can a s f as
dat t e tment f t

Th n mbc f f s t l f the uret ag l ty
tool ge but v th b tte und rst d g f th
bl o d s pply f e r s h cal m ties ar p t d
Lymph od n ol m t i r ble by g
e v d n e e d by the p t s f B ney d T g
d th e lts of th s s p t t t a d that
nt l ty l E w rd L C x t l l MD

M ng t W F d St t t z R T t t A b d m i n l
lty t c t my l m J Ob t 945 49 63

T t l b dom nal h y c t my p form don
95 m m t o l w h m wht d dg t
Th m j ty f the p t nt (593 p c t)
m l th h p t l f m t to f i days h for
l e t O l y 4 p t e p e r t d on
th t ty f h r s of dm n Th m
j ty f th p t (634 p c nt) d by
st t s l t r d nts

Th p c p l nd at n f h y t t m v n
cl d n h m v m f n c t on al bl d g pel c n
f m m t y d b g d m al gn t n
t m r s l m l g ant te n t m
Th u t j d om th q
p r s at th t m of tal pe t S b q t
op ton fo mplantat o w y pa

t e t Morh d ty rat m la t th f ay
hy t tom ie e p c t f th ty p f p e a
t o

D th oc ed 38 o 9 p r c e t f th p
t e nts T ty n n (3 o p e c t) f th f t l t
ccu d n th h r t h o l g cal h l f f th es
l o (94 p c t) n th s cond l f c t f
m type h fly p t n t u t e d f f th
38 d th

T l l h st e t o m y t a d g t l n t l can be
p e f m e l th ut d e h a l b y u m n o
t g f l C MD

ADNEXAL AND PERIUTERINE CONDITIONS

Wy et J Th Eff t f T t t r n P p t
2 Ca es f O a r i n Ca in m J Ob t G y B I
Emp 945 5 74

Th thor p nts c f v ca m
t t d by u g r v i dat nd test t e pr
p o t th l t r b g g b c f th pos
b lty that t m ght n h b th g ow th of th
pl m Alth gh b th f th p t e t s e b y
t e ly m p d th a n d c f g r e s
the eopl m B th pat t d d f c r m
J R W L s MD

P rk T J C cl m f th O ry Treat d Pr
p e l y w th D p \ y i m J Ob t 94
49 676

Th ca of p p l l v c v s t d a ma
p bl b ca f ma n f l t t th
s d ng tract p e n t d b c th
r p p r t l m d per bl b d p r a th
p I l l 3 a th pl m l m t d t t l
b d m l ca ty The v pr f dly f t l
the g app n f th t m r s b t a d r
l t l ch ng the m osc p p c t u
l o f th p t t r e l e c ft ght l
t l y r p c t ly the th d c m b d f t r
f i y r s t p p t l e l a t d c m

D p r a th p th 3 p t l ca f
the p p l l ry c nd t n l t t h l
d th t u ma t d m h h c h m i
the p a t one er

Th s study nd cat th t t a t p r s t i
d ng d f f u l t p m r y p t I m ca of
m s f l t t o n t m v b f e r t t k a b p s
clo th a l d m g d e p d p f m a
eco d perat n at l t t m
Ed rd L Cor MD

EXTERNAL GENITALIA

Brady L M thods f Con tru t i ng v gi f
S z 945 5 8

V ag na m d f 4 me b t th m th d
d n a h ca d f f t l th frst th
l b a m a u lly lo g and by t l g
th m t pos bl t m t f th l
m l g a th j th l m l th c l ca a
g h ch h t d t f t r v f r l

var as mad tho t y op rat n The ntel
lg nce an i coop r t f th s pat nt play d a large
pat n m k n g th s procedu e succ f l In th
thrd c e the Whart n t ch que was f llo d
Th c n t d n m k n g n l n g t l canal in the
pe n m and keep ng that t be p n by mean f a
g n a l f r m of h a l w o d F l l w g th techn que
h ch Wh ton first m m n d d th author made
n f l o t t c v r th ne l m ad vag n w th ep the
lum In the fo the c n x t e n s c p l a t c o f a
t o n v a s p f r m e d i n h ch the lab a m n o a w r e
a g a n e l t c e v w a s b t a s th y e
n t l o g th s t f a s u p p l m e n t l b y u s n g th
s k y of th p e r m m b t n th v th a a n d s
Th w a s c m p l h e d b y m k n g a n i n v r t e d
U s h a p d n e i n d s c t i g u t a f l a p b t v e n the
th a d th ru and c n g th s f l p d e p l y
i n t the n e l y m d v a g

Th thrd cas i th s e s e w a s p t e l l y i t r
e t i n g s n a d d t o n t th c m l y o l g e l a b n o
m a l i t c s f the g e t a l t t the l a n b
n o r m a l f r the u l g e l y t e m The p a t e n t
n l y k d n e y w l v n th p e l v and w a m t a k e n
b y s v a l e a m s f o t h u t e u The p r o b a b l y
s n e b t m th d f m a k n g v a g a I n th
w t r s o p o n n s h l d t k i t n d r a t o n
the a n a t o m f i n d n g s a d t h e t m p e m n t i n t l
l i g c a d m a t a l t a t f the p t e r t

C x l v M D

Wh r t n L R S p o n t a n o u P f r a t i n f th
R t g i n i S p r u m F i W e k f t e C o n
t r u t i n f th V a g i n a 4 S g 945
53

Th uth r s t a t e th t i s t r u c t f the g n a
l v e s th l c t u a f l a r g p e a h t w e e th
c t m a d b l a d d e f f th h a v e b e n f m u n
s f u l f t m p t s c t r u t the g a the
n m l p l a f c l e a g e p l d b y d n c a
t s u e Th s m a k s th c d e c t o t m e l d f f l t
d u n d r these c r u m t a n c e j s o f th r
t u m o r b l a d d r h a v e b n c o m m o d n a o i d a b l

The author reports a case in wh ch f for t n
occ r r e d f i v e a n d o n h l f v e e k f t r a s u c c f u l
o p e r t o n a n d c o n v a l e n c e a d w a s d u e t the
p r e s s u r e o f the s t n g p e r n a l m c l e n the v a g l
f o r m h u c h p u h e d the a g n a l f m th u g h the
v a g n a l v a l l i n t o the r e c t u m

From h u x p r i c e w i t h t h s c a the a t h o
c o n c l e d t h a t

Th v g n a l f o r m h o u l d n v e b e o h o r t t a t
t l e s c o m p l e t e l y a b the m u s c u l a r p l a n e o f th
p l v e d a p h a g m I n th c a e t h e v g n a l f o r m w
s o h r t t h a t i t d s a p p e a r d n p l t l y i n the l e
v a g n H e n a n y p r x t d b y the p l v c
f l o w a s d r c t e d a g i n s t the n d o f the f o m a n d
p s h e d the f o n h i g h a g i n s t the c t u m p o u l d e

f D o g l a s O n e s f g u a d a g a n t t h s a c c i d n t
w o u l d l e t h a v e the f o r m l g e n o g h t o p o t r u d
l i g h t l y f m the v a g i n l o r f i c e A f o r m f s u c h
l e n g t h c o u l d n t b p u s h e d p w a r l b y p r n e l
p r s u

A s c o n d s a f e g d a g i n s t t h s a c c i d n t l d
b e t o m k e the a g n a l o i f s o l g e t h a t i t c o u l d
n t c l o e o c o n t c t o v e r the e d f the f o m l t
s h l d b e l a g n u g h t a l l w the f o m t o s c a p
f the i n t a p l v c p e s s r e i n c a s d I t s h u l d
l a y s b e e y t r c h a n d r m o v e the v g n a l
f o r m Th v a g u l f c c a b e e l a g d e a s l y b y
t t a g th i n s t a c t o r v g n a m u s c l e a n d th
p m a l f i b e r s o f the p e r i e a l f c Th s a l s o
p e v e t s d y s p a r e u f t

3 C o n t u t i n s t o b e v d d Th p a t n t n
t h s r p o r t l d b n n s t p t e d I f c n s t p a t n
h o l d d f p the p t e t s h l d a v o i d p r e s u r e
t o p r o d u c d f c a t n

4 Th m e t h o d o f l s u r f the f i t u l s i m p l e
n o a t t e m p t w a s m d t d e t t h l a y r f
the c t o a g n a l s e p t u m a f o s e p p i m t i o n o f
the t n e d g e w a s p v d d a n d th w h o l g o n
v a s p u t a t e t h y m e n f a l a g r c a l t b I n
s p t f th u n f o r t u t e c c i d n t the u l t i m a t e s l t
s n t n t r l y u n s c e e s f u l

H a f T h o M D

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Msey R D Randall L M nd Doyl L W
Pr gnancy f llowing My m t my Am J
Obst 945 49 5 8

The e per ce f Muss y Ra d ll nd Doyl as
w llas that f th uth rs und c t s that my mee
t my h s ry littl eff c t on the urs f f tu
p gnanc es In th r on f ases the c d nce f
mp l cation f d l v r ncr s d om what b t
th m dern bst t ica dsu g calca e the nce ed
l c c t nly is not prohib t e ln of th o
w m n pr g ncy occurred 67 t mes after my mec
t my w s perf med In 35 of the 67 tances
th p gnancy cont n ed t e m n l t o t m
In 2 g p cent of th 135 n t a ces the hld
r del erd by es r an s t on It ev dent
the ef th t cesa ean sect as eq ed more
frequ ntly th t in an v geg p f l stetr c
ca es

It d fficult t ev l t e th ol f ut m my
mas a cau e of infert lty thout the benef t fa
complet am nation f all f ctors nst enc g the
f t l t n b th men and men Fr q ntly t is
not poss ble t nst gates safely tub l paten v in the
presenc f my mas which are p du g sympt m
The op on p a ls that the f t l t v f w mende
cre ses n th pres nce f my mas Th f ct that
only 8 of 8 p t nent h compl n d of fert d ty
p r t o m v mectomy sub equ tlv c d w ld
s m to b n g ament v th th tat ment l
th gh th thors hav no kno l dge of the f c
t rs which may ha e contr b ted t the infert lty
It s gnificant howe e that Bre nd J n s d d
n t find d nce of abnormal phys l cal c t t
f the o r s n th tud f th corp s lut m
d ed ment m n case of te n myom

Asal ge of 8 ch ld en n 67 nst nces f p g
n ney mong w omen who h d p ously d r
g e t r nce myom c t my n t d f h v t c tory
or rad t on f f b d m to j stufy my mec
tomy n el t d ca s n which th p t nts e
wom n f th hld a n ge It s r gnized th t
f t r m me t my pat ent run mor s k f rem t
postop rat e c m p l c a s h as intest n l b
struct n ths they do ster h y te c tory which
may be cc mp n d by p ton alization

Arn ll R E G ldm n D W d B rucci F J
Pr t n D f enc s n Pr gnancy J Am M
A 945 7

The p ent comm n c at n s ch fly an att mpt
to answe t q est ns () what is th m d n d f
p oter def c es th ult f d etary n deq
ces d (2) what is the pos ble ff t of ch d
f c es th moth and ch ld

As ega ds the inciden the a th rs tr s th t
d m trabl d gres f p oter def c y r n t

comm b t subcl nical def c ncy f equ t Th
a e age daly ntepartum p t n t take of 400 p
t nts of which 50 w e p t ate p t s (whites) a d
350 cl c m mat r l l made up of 5 whites a d
egree wa n est g t d It was fou d that 7
per nt f th 400 pat ents had p o t n ntake of
less than half f the optimum am unt r comm nd d
for the l tter h lf of p c gna cy When calculat n s
based the id l w ght ather tha the
tot l prot n t take n g ams the res lts w r mu h
th ame 74 pat ents fell nto the d f c cy g up
th t s the daly t ke of p ote was less than
0 75 gm p k l gram of body we ght a g nst a
d able nt k f r gm pe k llog am N th a
h gh ntelligen e rat n n ea y f n al circum
t nce p clud d th poss b lty of def c t e dets

Since a qual tativ s well a q a t t a d
f c ncy may aff c t the ntrog n eq l b m f th
body t sec mme ded th t p o t n d r ed f m
an m l s rces const t t tlea t 6 p e c t l the
total p o t n t ke O th b l the p ote c
tent the d t s w e las f d s vcell nt (d l m
tak of 8 rm egm of p tcm) 95 p cent f the
pat nts g od (from to 84 gm) n 5 p r t
fa (from 55 t 69 gm) n 3 p e cent poor (fom
42 5 to 54 gm) n 23 7 p cent d f all ty
poo (les than 4 5 gm) 80 p e cent Th last
gr p r ed less th n h lf th amount m
m ded by th V t al R s ch Co ncl

It s a furl y mpl m t t to d t mune th ncl
d ce of p t n def c c s n p e gna cy the e
f c t d qu p t n t ntake H w t d
t m neth poss bl ff t of uch def c e s n th
m th r and ch ld s mor d f f c t For nstance
d d t nt the t r u n to th p c e of such n
det m nabl f ctors abn mal ab rptu a d
t l z t n of th ng ted p t nts the m e com
plet t l z t on f p r t w th n the b dy wh th
ntak s l w a d th c e s d dem nd of p g
a c th s add d th l ck of method fo d t
m g th p o t n tent f th t s which
depl t d reserve may escap ntice a d th and f
nt h cter f theres lts wh ch f llow d q ate
prot n n t tution when (l e s a d monst bl hypo
proteinem de l ps nd d ma n s es) the ma
festations m nt t l t l m e than a slow and
ns d u wasting away f l l th t ues ith as o
c at d we kness nd g l l l h lth

Howe a s gn f c ant l tionsh p was us ally
f nd to t b t n the rump o t c entra
to f the blo d t t m d th p t n nte t of
the d t d g th l t t h lf f pr gn cy the
e ge c e c t t n b gl west n the d f c c y
gr p f p t nts th t s th fifth g p w th less
than half th opt m m ntake A l o the m e n hemo
glob n of th d f c n gro p (8 3 gm pe oo c)
was 6 p c ntl w th n th of the gr up; wh
the p o t n t ke was e c l l t (gm per 100

cc) In the type of anemia the administration of iron will be without effect on the anemia until the protein deficiency is corrected. There is no association of eclampsia with the series however the big effect of the incidence of pre-eclampsia was in the deficiency group. The experience proved the fallacy of the habit of treating meat and eggs in the diet of the pregnant woman which was generally practiced in the past and is still practiced in some quarters at the present time. In the past too much attention was focused on obstetric complications and abnormal fetal causes of maternal and fetal morbidity and mortality and to little attention paid to the general nutrition of the patient.

The ewing nomal mortality in this series but a significant relationship was found to exist between the maternal morbidity and the protein content of the maternal diet and the morbidity in the deficiency group being five times greater than in the excellent group. The fetal mortality including stillbirths and neonatal deaths also bore a significant relationship to the maternal protein intake the percentage of fetal mortality for the five groups of maternal diet being respectively 0.2, 0.4, and 5.5. The greatest average maternal gain in weight during pregnancy in the deficiency group is explained by the tendency toward high ingestion of carbohydrate diet with the protein intake was low and suggests a high gain in protein for the restriction and reduction of weight during pregnancy. The absence of effect in the average fetal weight at birth supports the supposition that the fetus in utero is a passive and passive why the child at birth weight cannot be controlled by any known dietary means.

Here the most striking continuation of the results of increased protein intake in this series comes from a study of the protein assumption of a small group of elderly patients who manifested evidence of protein deficiency. The patients were admitted to the hospital in the last trimester of pregnancy because of mass excretion of albumin. Further investigation showed the elderly in all of them (old subjects) to be due to a basic protein deficiency which fits in doubt that the tendency toward protein malnutrition is more likely to develop in older women and that it is increased by the strain of repeated pregnancies in rapid succession. In all these cases complete recovery ensued on a regimen based on replacement of protein deficiency.

Thors find that the protein needs of repair growth protein deficiency (addition) such a high protein diet as will be provided by the patient's ability to utilize oral feedings is represented by blood transfusions blood transfusions supplied by minor cations correct the anemia and the transfusions with plasma or plasma supplied by minor cations. JOHN W. BRENNAN, M.D.

Ogilby J. K. Habitual Abortion. *Am J Obst* 1945 49: 633

Prior to the present treatment of repeated abortions the cause of the second abortion was limited to months

of absolute bed rest. This was often ineffectual as spontaneous abortion during long immobilization.

The husband and wife should be subjected to investigation as painstaking as that undertaken in the diagnosis of sterility. There is a correlation between these two conditions. Women who are infertile because of ovarian failure and who later conceive often abort as a result of the cause of the sterility. Appropriate treatment should follow the discovery of any possible causative factors. The conception of a retarded placenta is best done before conception with the fitting of a pessary. Too much manipulation of the pregnant uterus may cause abortion. In the majority of cases however no local causes are found and the management resolves itself into measures aiming to correct deficiencies of endocrine and vitamins. The patient should be instructed to refrain from exertion on the days of her first four missed menstrual periods. Intercourse should be interdicted for four months. The entire subject should be carefully explained to her so she should be encouraged but no absolute promise of success should be given. Because of their intense desire for children these patients are usually cooperative.

Pregnancy is begun by intramuscular injections of units every four days after the first missed period. In case of any bleeding or placental separation the patient should be put to bed and the frequency of the progesterone injections increased. Morphine is not indicated but simple sedatives can be used. For administration of anhydrous progesterone offer a more convenient method of therapy. Hamblen believes it to be as efficient as the intramuscular injection of progesterone. So let Krohn and Greenblatt concur in this. Still another method should be used because of its simplicity and economy. It is a further trial—that of pellet implantation described by Mishell. Interruption in the third trimester of pregnancy indicated by contractions or rupture of the membranes may be due to the preponderance of fetal progesterone and indicated and may act as an antagonist to the maternal labor.

The tendency of the 30 women who have habitual abortion to nullify the treatment and treatment and give birth to normal children. Uterine contractions during the case of a third trimester of pregnancy. Successful treatment of a pregnancy treated by physiotherapy abortion does not guarantee fertility in a subsequent pregnancy that untreated.

Two possible fields for the investigation of the cause of repeated abortions are (1) the qualitative relationship between the estrogen and coagulation factors and (2) blood incompatibility of the husband and wife similar to the Rh factor in erythroblastosis.

While the estrogenic effect of the mental level denests the value of progesterone to prevent abortion the author believes that the results reported by many careful observers warrant its continued use although the better method is still doubtful.

E. A. D. COVILL, M.D.

The ratio of 3:1 in favor of the dequately K. tr. t. d. cases might appear to constitute convincing proof of the efficiency of the m. n. K. b. t. a. t. h. r. u. g. h. analysis. It is called that the higher mortality rate in series D is due to the preponderance of those factors usually associated with death of the infant rather than the lack of vitamin K.

The authors describe the intramuscular injection of vitamin K in all infants soon after birth for the prevention of hemorrhagic disease of the newborn.

E. T. S. E. A. R. T. E. M. M. D.

R. S.enthal S. R. Bl. hd. M. nd. L. sl. E. I. Ten
Y. ars. E. peri. n. e. with BCG (Experimental
and Clinical) J. P. d. i. b. L. 1945 64

In a study of bacillus Calmette-Guérin vaccine in newborn infants, the emphasis was placed on having adequate nutrition in which the multiple puncture technique was used to introduce the vaccine. The following results were obtained:

The vaccine has been found to be not only non-toxic but locally and generally non-injurious. It has been used over a period of ten years and 302 children in infants which were observed for a period of seven years.

2. Among 24 vaccinated children with no known source of contact with tuberculosis there were 3 cases of tuberculosis and 2 deaths from the disease whereas among 23 controls there were 3 cases of tuberculosis and 4 deaths from the disease. The follow-up period was from the age of eight years to months.

3. Among 98 vaccinated newborn infants who were in contact with tuberculosis following vaccination there was a recurrence of tuberculosis and no deaths, whereas among 63 controls three were 4 cases of tuberculosis and 3 deaths.

4. With regard to the contact and noncontact groups as a whole, there were 27 cases of tuberculosis, the total of 4 cases, the vaccinated infants were 7 deaths from tuberculosis in the contact group and in the vaccinated.

From these results the authors concluded that the first essays of the bacillus Calmette-Guérin vaccine at 0.5 cc daily for the first three months of tuberculosis.

The authors recommend that the benefit of the vaccine should be given to all children living in highly infected tuberculosis areas not withstanding the absence of tuberculous infection immediately before birth. When tuberculous infection is present at the time of contact with other infectious diseases should be practiced. In other words, bacillus Calmette-Guérin vaccine should be applied as any other type of vaccination. It is likely that contact is responsible for the greater mortality of infants with tuberculosis. E. T. S. E. A. R. T. E. M. M. D.

MISCELLANEOUS

H. H. r. A. M. nd. Pa. k. J. Th. Tran. m. i.
Penicillin therapy in the P. e. n. t. a. Am. J. Obs. 1945 49 663

One hundred thousand units of penicillin injected intramuscularly into the pregnant patient at term will result in an adequate bacteriostatic penicillin level in the fetal circulation. The authors have no data on the percentage of penicillin therapy in the percentage of patients in the first trimester of pregnancy. One patient had postpartum blood clots but a normal pelvis. The patient had had a normal delivery and a normal placental infarct.

The fact that penicillin passes from the mother into the fetal circulation is an effective concentration suggests that rapid application of penicillin is a safe method for the control of penicillin sensitivity. The authors report that the authors have observed a high rate of infection in the mother and the newborn infant. Of these infections, the authors should receive the greatest attention. If penicillin should be given to the mother and the newborn infant, the authors should be careful to avoid the use of penicillin in the mother and the newborn infant. The authors should be careful to avoid the use of penicillin in the mother and the newborn infant. E. T. S. E. A. R. T. E. M. M. D.

GENITOURINARY SURGERY

ADRENAL KIDNEY AND URETER

N. ti n E F R n al Ectopi A Study of 23
Cas Am J S g 945 68 67

Ectopi: impl s congen t l d placement Ren l
ectop a may b f al d gr es and types There
ar 3 g ne al level hich the di plac d kid y may
occupy th lov lumbar reg on o i h c fo a the br m
f the p l o thele el b l th br mo f th p l s—
the tr e p l ic kid v The lwer the kid ey the
near e the midl e it u l l v l es Ectop a may be
u lateral or b lateral Both k d eys may occupy a
pelvic post a d b f d t f o m a cake or
h l d kid y e f the est f m The k d ey
m v be d p l c d to the op os te s de of the b dy
f m ts n tur l pos t on Such a kid y m y then
be f ed th or l d st l t the othe kidney
Th s c r o s d ctopia f ed o n f u d th form r
b g m h m e common St u d e s f a s
autop s i i dicate that the eide ce of l l types
of r al ctop varies f m 500 to n 500
aut p s i The c l n cal eide ce is much g ater

Tw ty th cases 15 top ya d 8 clinical re
r p d t h e s w f the foll w g types lumbar
3 (3 percent) il of m b r 4 (74 pe cent) pelvic
ra (5 per ce t) a d c r o s s d 4 (74 per c t) Of
th last 3 v f ed a d i w u n i f u d There
was instance ach of s l i t a y p e l c kid ey and
b l t l enal ctopia

Th teen of the pat ts (56 s p e t) ere fe
males d (43 s p r c n t) w e m l e s In th
a tops ed s e r e s ren l ct pia was 13 per c n t m e
e m m m f m i s t h a n m a l e (corr ct d f
gr ter pe ce tage of m l e aut psies)

The m r t y f p a t e t s ce cl ically yo g
and adual 62 s p e r c e t o f h m w re u d th ty
years of age

The ght a d left kid eys were lved th
ab ut qual f e q n c y

l 5 ca es (23 per cent) the e w r ther con
g tal abno m l t e s of the t p e k d y and
4 cas the wer cong ital lesions of the oth r
k d ey Thr f the g l e s i o wer s e

Pa usually in th low pa t of the abd men or
b k s th chief ompl int Nephrect my was
d e n 3 (37 s p e r c e t) of the cl ical cases of enal
ct pa l l e r in th m j ty of cas s enal
t p w s p p a e t l y c m p t b l i t b c m f r t d
good h l th

U l g cal t u l sh o l d be ca i d out the
cases f l l pat n t s wh have c n g ital ab or
m l t e s f th g n t a l g n s

D to F McDon to M D

II ey N S a d K t h m II L Py l l i d f
Pr g n n c y J Am M A 945 847

II an y and Kr tscher imp e d w th the
ed ct on in incidence of pyel t of p g n In

the l t ten year the incidence of py l t i s of pr g
nancy in the Pr s b y t e H s p i t a l of Chicag
nly 3 p e c e t Th s study c m p r s e d 982 d
l v e s

Dil t a t i n of th k d ey pelvis and u e t e i not
considered by them to be a major factor in this d s
ase m that the same auth rs in a previous tudy
found dilatation on ntravenous py log aphy in
oo per c n t of the cases seen duri g pr g n a n y and
the puerperium

Th auth rs b l e c that pyelitis of pregnancy is
a p e e t ble disea e prevent on c n s i t i n g of meas
u e s designed to locat a d e d i c a t e f o c of infect
in th prep ation of omen for expected pregnan y
W I L I A M W S c r r M D

Lowal y O S nd Curtis M S The Surgical
A p e c t f C y t l c Disea f th Kidney J i
M A s s 945 7

The author d s c u s s e the vari s f o m s of cystic
d ease of th k d ey ith pa t i c u l a r m p h i s n
the surg c l aspects and revie s 74 ca es of re l
cyst c d s e e adm t t e d to th D partm nt f Ur l
gy (J m s B ch n a n Brady Found t o n) of the
New York Ho p t a l d i g the pe i o d from Janu
ary 941 to April 944 Of the e 10 e c a s f
s mple renal cyst 53 of poly cyst c d s e e and 2 of
chi o c o c c u s c y t

S m p l e l c y t The term s l t a r y e n l c y t
err n o s and should be repl ced by th term
simpl re al c y t

S t f c t o r y results w l l be obt ed n the g e t
m a j o r i t y of cases of s mple renal c y t h r e s e c t o n of
the f e e p o t i o n f the cyst w l l v t h u b e q u n t
phenol at n of the b e of the cyst a d c l u r e of
the resultant d f e c t w i t h f a t p a d and chrom
ribb n gut N p h r e c t m y i n d c a t d i n n l y
small percentage of cases

M l i g n a n c y could be str ngly s p e c t d n a l l
r n a l cysts containing hem rhag c m a t i a l and
n l e i t can be d f i n i t e l y u l e d t n p h e c t o m y
sh l d b e d e a s a p p o x m t e l y 51 cent of hem
h g i c cysts have been fo n d t b e m a l g n a n t

P o l y c y s t i c e l d s e a P o l y c y s t c r a l d i e a s e
a congen tal p b a b l y l w a y b l a t l a d p o
g i v e p a t h o l o g c a l e n t i t y

S g e r y m t h c n d t o n s p e t t y m c h l m t e d t
the c m p l c a t i o n s i s g r f m i t M u c h c a n b e d o n e
n p l o n g and m a k i g c m f t a b l e the l e s f
pat t w t h p l v c y s t c d s e e b y the m p l y m e n t
f a j u d u s m e d c a l g m e n N e p h c t o m y
h u l d b e d e l y a s a l f e s a i n g m s u e n p a
t e n t s w h o h a v p l v c y t c k i d e y s

E d s y s t f the k d ey R n l s g e r y i
i n d c a t d f o t h g e a t m a j o r i t y of p t n t s w i t h g e r y i
d s a s e A t p e r a t i o n g r e t c a e m u s t b e e c s e d
t o p e v t s p a l l g e f the cyst c o t e n t s s i n e
e v a n p h y l a w h c h o f t e n f a t a l m a y r e s u l t

o pa a t m \ b π l t d n the c ntam nated
t s J I K r MD

BLADDER URETHRA AND PENIS

A tscim r II L End m tri f ti Bladd r
J L I Blt 945 53 4 9

The l m nt f th u nary tr ct by endo
m t s unc mm but th bl dde be ng in
lo p m ty to th p lnc org s may be aff cted
n gh o that th u ol g t hould b famila w th
th p th l cal con l tion and with the fact that th
bladd r m v become in ol d

The n l e d n t r o s s d f ficult to e pla n
o the ba l of one theory a d e v d c h s b e
g i th lte atu h h upp rt and lutes th
va u the ries p es nt d

Th l f ent hypoth se advanced may he
g o ped broadly a follo () the embryo ic
() the m tapt st c and (3) th m gratory

Enb the 3 Th wolffian theory ith
spe t to ute i e denomyom s p t for and by
o R kl hausen n 896 he ble ed that the
glad lar ncl s th uter n ll we e de va
t s f the llian du t b cau e f the morpho
l g cal r s mbla ce b tw en the h t logical truct
r f th ade om y ma a d th t of th wolffa
body

Metapla t th 3 Th r s s p thel al theory
stated b Iwan ff in 898 and later ampl f d by
Mey n 194 b s such uppo ters a M y
L u he Witherspoon and M Th theory
b s d pon the f t that the nt e p th m f the
fem le ge ital t act d r ed lom the l m c
me th lum o that a a r s l f ch n s t a t o

flam m t n sug al traum or om horm nal
t mulus th seros f the p t um derg s
metapla sia ha ge the l m n p thel un and
f ms gland that es mbl ndom t m r t b l
muco in ppear ne nd fu ct n

M g t r y t r y Th hypothes assu s that
th nd m tral l k t s e of ndomet o h ts
gn n th te muco a d ch s t s et p c
por ti onl by () n (2) mpl ntat o o
(3) metasta

The o curr ce of dom t o of th u ry
bladd not f d t any p r tcul ag gr p
Hematu h n p e t du ng the me es i
alm t patho m n of r dom t r o s p e cially
n th prese e of f qu en y dy na n d eical
r t b l ty t eth r v th a pel cms

A e dom t s f e qu tly n f s d th th
s call s n pa t l rly m t n t tum r y
t c p find s d i g n o t n most cases f th
nd t n s b o n m d n ben the p t nt g es a
h t r y of v l cal sym pt m

The m r ty of th h t c of th r port d c s s
r e l d th t the pat nt had had o o mo e p ly
or bd m l ope at b f r th e d met i f
the bl dde wa d co e d

M t a th ag r e th t th duct f r th
ial m p u b v b f t e r a l o o ph r ct m v o r d

t n f the o a e i d ated in j at nts at r e
th m n p r f the i m e i v l eme t f
th bl l t ad c d f r m j et em al

It ll k th t dom et may hec me
m l g nt but m t auth r tie o s der th a rare
curr nc O the oth h nd Sutt n has re
marked th t a b r nt dom t um h th gr w th
u ge as do s ca c r d h q e t n th a ty of
malign t h a g s Jo A L M D

Emm t J L T n ethral R sect on in th
T e m nt of T and Ps ud Co d Bl dde
J U l B l t 945 53 545

Syphl s f the c nt al nervou syst m (d d og
t b dors l) ot the mpo tant et l cal f i
i u r y retent n that i p e o ly as be e cal
t b Altho gh t b s d sals n y p oduce es cal
t ny n many ca e bstruct n of the ves cal n k
p nt n m st cas d consid r bly m
th n go p cent f th cas s th ves cal dy fu ct
ca b r l e d ompl tely b t r n u th al res ct n
of th ves cal n ck

U nary et nti n y u g dults h ch fo me l
as ga d d s b ng du t a n r g n bladd
atyp cal d bl d l n a l y al y d to co
gen tal ob t ct on f th ical ne k l s me
s s l ght m y elod y pl s a may be ass e at d
th sp n b d a ccult Th les on m y p odu e a m d
type of utonom u bladd th j st n gh p e
t phy f th d thr r mu cl to be ma f t a s
hyp plas f th r cal neck In eth ca
tr n u th al ese ti n will l e the c nd to
L en th ough bstruct n of the v s cal ne k t
p lly app nt cystos ope x m t
t nsu eth l e ct n h l d be t d s th b
tr u t f t n t appa t unt l ft th
e t s b gun

Tru rd bl d d r w h ch ults f m a tru l s
f the p l ord p es t n nt stin u gal
pr blem l pract cally l lica es th det us m l
s hyp e t n c nd hyp t ophied t om d ge th
bl dde tr h cul t d es d al r o i pr e t
and ther t p f tve n r y n t
e c O the ba s f th th ry that the h per
pl i f th p r t n of the detru m cle r u d
th l k (s call d nte l es cal ph t)
may be n p r t r go bl f th es d al r e the
po b l ty f t r u eth l ve tion s att t
a d th r l t s em to b g g

Emm t a d h s ate h b en di appo t d
uth u e f tometry d h ba do d t u
a a d gn t a d Th bel th t m a cu te
f m t n e b obt n d f m th p t nt h
t v b phy ical and n logical xam t by
det m nat n f th m nt f es du f u n nd
b v s tos p e xam t

Milt r J R Pr l p of th U thra T ted by
th H p r l Operati n A J O b t 945 49
59

P lapse f the f m l u eth is a el t ly ra c
co d t w h ch ho l d b ? r d most f e quently

by gynec l g t C cul r xc fth pmlap l
m oc a man e mlar t th Whl l al p
atio f r h morrh l i l ca l l fa r f t l
supr p b c pe n fth r thra n l l d l
ad ocated by Heph Th r at on i m pl
n d flect and g e s l t g good l t can
be pe formed not ly in ch l d en but al o the
aged a l ven in th pr sence of m k d l b l t
l t eem p o t a b l that th angulat f th
th a hich s a m l l h e d by th su pen n
p dur m y h a e useful place in th t atm t
of ar v inc n t n ce v h the ureth a d it
v l t y sph n c t r h a e b k n y f m the r
n m l attachm e t t th upport g f c
th v i h y
Th r l t n a c a s a e g v e
f l C M D

GENITAL ORGANS

L tch m C W a d Emm t t J L Tran urethral
R ect n fo M n Eighty r Mo Years f
Ag J U l B l t 945 53 45

I r t the ad t of m d tra ur thral re
sect th ut l k f th p t h wa ghty
or m re y a f ag d s f i g th prost tism
was at h t d co g G n e r a l e r e n c e with
p t t e t my for m n o f such ad a dag was s
t f e t o r that su g o c e l k l y t d

ag d r a t i o n f a j e r a t
I c t y e a r c t h d v n t of successful
tr th l r e s e t n t l t o r of a r t i c l e s d e a l g
w t h u b j e c t h a h n g d p l o u d l y
F p n e a t h M y C l n i c t h a t a l
c t t h e p a t f y r s m u h n c o d w t h
th p c e f t h r s a g e n o l n g g a d e d
c t a l e a t t p t a t e s p r v a d w e
k t h a t p a t n t s f a d a n c a d e t l e r a t
tra ureth l r e s t a l m t s c l l a s v g e
m

D l n g t h i y s i r m 934 t 94 l
345 p t e f e ghty or m years of ag w
t e d b y t n s u t h r a l c t i o t t h C l n c
S t y f o u f t h p a t t w e r e h i v i o r
m o y e a of ag a d y e t y m y r s of
G o a d m s t h v a l f b l d c of 76 of
th 345 p t t s w m t h 50 m g m p o o c c
h e a s i r i t m t h 70 m g m p o o c c
l 5 c a a v e c a l l e u l u s s a t d t h t h e
d t o d i 4 t u m o f t h e b l a d d e l
p t v c l d t c u l e e p s e t 3 c a
A o u l d b e p t d n a r e f p a t e t f u c h
d c d a g t h c d e n f s s t d l
h g h f t a c 42 p t t w e n d d p o o
k f s u g l p l u b c u f e r d d
T o h d h d c e e b o s e l a r c d n t p r e
l a n d h d p a r l y s i s of t h f w r t m t i c s
T w n t y of t h p t t s w s f i g f m d
b t s m l l u t Th w r n m s t h
t l d s e
Th d c f p s t a t c m a l g t l s s
t h g g u p f c e t e s t g I 4 (30

p r e t) t h e t u e r v l a t t l t n e f r e s c t i o n
n l g a t l 6 c a s e n t i c l u d e d t h 4
t a l e l l t a t t h j t a t a l f t l v a l g
i a n t y t t h t s r n v c l r p o r t e l t b
b g l t l j a t h l g s t
Th n d o u b t t h a t e f t l g a t t f a c t o r
w h c h t r i b u t t t h e l m o b d t y a n d m o r t a l i t y
f t r a n e t h r a l e c t o n n t h i s g r o u p of g d f
t t s i s t h h e f p r p e r t i a d p o t p e r a t
p e l f b o s p a l i z t i o n J o s v v L o M D

M t G B I d o p t l l G n g n f t h e S r o t u m
L n c t L o d 945 48 404

In a case of called id path gangr n f the
c t u m c n e r a t v e m e u r s i n c l u d i n g t h l o a l
a n d g e a l a d m s t r a t i n f s l f n a m d e e
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t m l d b e c u t e i f e t a g e n e of the cr
t u m s i n c e t h i s u n d o u b t e d l y a n a n f s t a t i o n
l c t n a l t h u g h a v a t y f g m s m a v b
e p o n a b l e

An analysis of th 24 r p o r t d e c a m a d
f t h p i t t i c f e g i n c i d e c b a t e r i o l o g y
o c c i d e t l e o s i g n s y m p t m s a n d c o m p l e
t o n p r o g n o s i s a n d t a t m e t
C o n r v a t i c m e t h o d of t r a t m t a e u f f e c t
l e s t h e g a n g r n e s p a d s i d e l y n e t h e s c r o
t m r a p l l v r g a t e s n c o m p l i c a t e d c e
C L Z B i o M D

Ormond J K Cothran R M and Singl J A
Operat n f r U n d s e n d d T s t i c l J L I
B l t 945 53 60

Th a t h o r s p r e s n t a s t u d y of 6 o p r a t i o n f
d e s c e n d e d t e s t e l e The m a j o r t y of t h c o p
t o (70) v r d e b y t h l a s t c h a n d m o l f i c a t i o n
f t h B a n p e r a t i o n l s r s of o c s e s n
w h i c h t h y p e of t r a c t n s u d u e a s b
t a i n e d 91 p e r c e n t i n a r f 6 c a e i n h i c h
n o t r a c t n v a s u s o f 53 p e r c t p e n t e d s u c c e s s f l
r s l t The U k t c h n q c a s u e d n o n l y 5
c a s e s t h e r f o a s t a t t c a l c m p n i s i t h t h
C a b t N e s t e l t e b a d p r o c d e u l l b e of n
l e

The t y p i c a l a c t u t u o j r a t o n d e s c r i b d
n c o n s i d e r a b l e t l R f e c m a d e t o b t h t e
n l a n t l a n d d l f t y p f h e n a l a c t
d t h t h e u d d e s c e n d t t c l H n a w a s
c c o u n t d i n o o f t h 3 c s e

W M W S T T M D

MISCELLANEOUS

R y n l d L R n d W y r a h H M U e of
P n c i l l i n i n t h T r e t m n t f U g n i t i l n
f e c t i n J L I B l t 945 53 644

Th t h o r s o u t l i n a p l n f p n c l n t h e r a p
f u r g i t a l i f c t o This s t u d y i s b s d n 509
g c a l a d 26 n g n o c o c c l f e c t o n
N n e t y g h t p r c n t of t h g n c o c c a l g r o u p
w r c u d b y t h i n t a m c l r d m t t n f
o o o u n t s f p e c i l l n v t h e h u n t l

pa a t may b mpla t l n th c nt m t d
t u J L K c M D

BLADDER URETHRA AND PENIS

Kretschmer H L End m t i f t l Bl dd
J U l B l 945 53 4 9

The l em t f th r nary tr t by end
m tr s unc mm but th bl dd r bet in
l epr m ty t th p l c rg m y b f l ted
h s th t the rol g d ho ld be f m far with
th p th log alc d t on a d w th th f ct that th
bl dd r may h c m e m o d

Th i f d m t j o i d d f f l t o e pla i
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g en the lter ture h ch upp rt ndr fut th
i theorie p es ted

Th d f f ent hypothe s dva ced may be
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Emb j ic H y Th w l f f ian the ry w th re
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gl d l a n l s s n th ut rin fl w red va
t s of the wolff d t becau e of th m ph
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b d y

M t p l i th j Th o saep th l l th ory
st ted by l f f i 898 d lat r amp l ied by
Mey s 1924 ha s ch pp tr as M ver
La ch W therspo d M egs Th theory is
based p the f ct that the tre p th lum of th
f mal b t al t c t s de d from th cel m c
m othel ms th t as res l t f ch o c i r i t a n
n f f m m a t o s g l t a u m o m h o m l
st mul s the se sa f the p t u m d e r g
m t a p l a s i a ch a g e th c l m a r p i t h e l m a d
f m s g l d th t r m b l e d m t i m t b a f
m u c o a p p n c n d f c t

M s g i y H o y Th hypothes s um that
th endomet l l k t s f d m t r o s h a t
o g u a the t e m u c o s a d r e a h e t e c t p
p o i t o n l y b y () s i o () m p l t a t o r
(3) m t a s s i s

Th u r e c o l e d m e t i th n r y
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H m a t h p r t d g the m e s e
a l m t p a t h o m n c o f n d o m e t r s p c i l l y
n th p r s e n i f f q u c y d y s u a a d c a l
r t a b i l i t y t h r w t h a p l y m s

As d m t s i q t i l y f d t h o t h e r
c a l l p t l i l y m l e n t t m y s
to p c f i d g d g n o t c m t c a s s f t h
c o n d i t b n m n d h n th p a t t g a
h i t o r y f y c a l s y n p t o m

Th m a y t y f i t h s t o r s f i t h p o t e d c a
r l d t h a t h p t t h d h a d o e m p l i
r b l m l p t s b e f t h n d m e t r a o f
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M t u t h r s e t h t t h n d c t n f n r t f i
e a l m e p a b y b l t e r l o o p h t m r a d i

t n f t h o e s d t d i n j t i t a t e r
th m p r f t h r e m s s i o l e m t f
th bl dd t a d d f r m p l e t r m a l
It l l k th t e n d m t i may b o m
a l n t b u t m t a t h i t e d e t h s r a e
c c r c O n t h t h h n d S t o h a s r e
m a l e d t h a b r n t e d m e t u m h a t h g r o t h
u r g s d s c a n c a d h q u e s t i o n t h r t y o f
m a l n a t h a e s J o h n A L M D

Emmett J L Tran r th l R t l f th
Tr a t m n t of Tru and P u d C o d Bl dd
J U l B l 945 53 545

Syph l f the c n t l n r v s y s t m (c l d n g
t a b e s d o r s a l) n t t h i m p r t a t t o l g i c a l f t o
u r a r y t e t o t h t i t p r v o l y w a s b l d
t b A l t h o u g h t a b e s d s i s m a y p r o d u c e c a l
a t o n y i m y c a s o b t r u c t i o n o f t h e c a l k
p e s e t n m t s a o d n e s i d r a b l y m r
t h g o p r e c t f t h e c a t h v c a l d y f a t
n b l v l m p l e t l v b y t n s e t h r l e t n
f t h e s c a l n k

U j t e n t y g a d l t w h c h f o r m e r l y
w g d d s b i g d t a n r o g c b l a d d o
a t p e a l c o d b l d i n l y a l a y d u t o
g t a l h t c n f t h e s c a l n k l o m
c a s e s s l g h t m y l d y p l a m a y b s s c a t d i t h
p a b n d s c u l t a T h l e s n m a y p r d c e a m l d
t y p e f t o m u s b l a d d w t h j u t e g h y p
t j h y f t h d t r u m c l t b m n i t a
h y p p l f t h v e c a l n e k l e i t h c e
t a n u r t h l r e s c t l l e l e t h c d i t
E n t h g h o b s t c t f t h e c a l c k t
e s p e l l y a p p a t o c y s t c o p a m t o n
t n s e t h r a l e c t n h o l d b e t r d a s t h e b
t u c t o f t n t a p p a e n t n t l f t r t h
c t n i b e g u

True d h l a d d e r h h u l t s f m a t r l
f t h p a l c d p t s n i n t e s t n g g e a l
p b l m i n p c t l l y l l c a s t h e d t o m c l
h y p e t n c a d h y p e t p h a i r e d m l e g t h
bl dd t s o b c u l t d r e s d u a l u e s p s t
a d t h r s o m t y p i t e y n c o t
n c O n t h e b a s o f t h t h y t a t t h h y p e
p l a s f t h e p r t o n f t h d e t r r m u l d
t h e c a l c e k (c a l l e d t l c a l s p h c t r)
m a y b e n p t p n a s l e f o t h r d l e t h
p b l t y f t u t h l e s t i o n s t t c t
d t h e s u l t m t o b n e g g
E m m t t n d h a s s c t h b e d p p o n t d
u t h u f j s t m e t d h b n d n d t u
a s a d g t d l h b l t h t m c c r t
n f m t c a b b i d f m t h p t n b
t j b y p h y c a l d c l g c a l c a m n t n b y
d t r m n t o f t h m t f d l a n d
b v c y t p m t o n

M i l l J R P r i p f t h U t h r a T t e d b y
t h H i p h u n O p e r a t i n A J O b t 945 49
59

P o l p e f t h f m l t h a l a t e l y a
o d t w h c h h i f b b d m t f q t l y

by gy c log t Ci cul n fth pr laj l
m cos in a manne mlar t th What h a l o p r
at o l r h m r h o i l d s a l l n f a v r f t h
supr p b e s p e n s n f t h t h r a a d i l d
ad cated by l i e b Th p r a t o n i m p l e
a d f e c t s and g e l s t g g o o f e s l t s t c a n
b e p f o r m e d n t n l n c h i l d e b t a l t t h e
a g d a n d v n n t h p s e n c e o f m k d l e b f t
I t e m s p r o b a b l t h t h a n g u l t f t h
t h a w h c h s a m j l h e d b y t h s u s p e n n
p d u r e m v h v e a u f u l p l a c e i n t h t t m t
o f r y n c o n t i n c e h t h u e t h a n d i t
v o l u t v s p h n e t h a e b o k e n v f r m t h e i r
n r m l a t t a c h m e t t t h s u p p o r t s f c
t h s v l h y
T l t n 4 c a s e g e
F u r L C M D

GENITAL ORGANS

L t e h m C W a n d E m m t r J L T r a n u r e t h r a l
R e c t n f o M n E i g h t y r M Y r s f
A g e J U l B l t 9 4 5 3 4 8

P r t t h e a d v t f m d e t r a u t h r a l r
s c t t h u t l o o k f t h p t n t w h a s h t y
m y e r s o f d s f f i g w t h p r o s t t s m
w a t b t d c o u g n g G e r a f e p e r e c e w i t h
p o s t t e t m y f o r m n o f s u c h a l a c e d a g a s s
t f c t o r t h a t s u g e e l l y t d
a c s l t i o n f a n o p e t

I e n t y e a r s c t h d v e n t o f s u c c e s f u l
t r t h a l r e c t t h t r f a r t i c l e s d e a l g
t h t h s u b j c t h a h g e d p r o f d l y
E p e n c a t t h M y o C l i n i c t h t h l
s t n t h e p a t f y a r s m h i n c o d w i t h
t h p e c e f t h A g n o f g r e g d e d
a c t d c t t o p t a t i e s e r a d w e
k t h a t p a t t s f a d v a n c d a g e t l e r a t e
t u r t h l r e c t a l m t s c l l a s y g r
m

D i n t h n i c y s f r m 9 3 4 t 9 4 l
3 4 5 p t e s f e i g h t y o r m y e a o f g w e
t r e d b y t n s t h r a l c t i o t h C l i n e
S n t y f o o f t h p a t n t w e h t y f i o r
m y a r s o f a g e a d 7 e r n e t y m o y s o f
O a d m i s s t h v a l l b l d o f 7 6 l
t h 3 4 5 p t t s w s m e t h a 5 0 m g m p o o c c
h a s f 2 i t w m t h 7 0 m g m p 1 0 0 e e
l 5 c s v e s c a l c u l u s v a s t d w t h t h e
c d t o d i 4 a t u m o f t h e b l a d d e l s o
p s n t v i c a l d t c u l w p e s e t 3 c a s e
A o l d b e p e t e d n a r o f p t e t f u c h
d n e d g t h c d e c f s s c t d d
h g h F t a c 4 2 p t t w i d d p o o
k l g l p l r b e a u f e a r d c d
e T h d h d e e h c u l a r d n t s p e
l y a n d h d p a l y s o f t h s o w t m t i e s
T w t y o f t h s p t s e s f f e g f o m d a
b e t s m l l t T h e w r n m u t h
t d d s e

T h c d n e f p t a t c m l g n t f i s o s
t h g g u p f c a s e s 1 5 t e s t g l 4 (3

I e t t t h t s s e r u m v d a t t l t t f r e c t i n
a m l a n t l 6 c a s e n t a c l u l l t h e r 4
t l l v f t h a t t h t a t s l f t h y a l c
a n t v t t h t r e v e l r j o r t l t b c
b g n b t l p a t l l g s t
T h e d o u b t t h a t e f t l g r a t t f a c t
h e h e t r i b u t t t h e l w m o b d y a n d m o r t a l i t y
o f t r a n e t h r a l r e c t i o n t h i s g r o u p o f g d p a
t t s i s t h b f i r e r e r a t l p s t p e r a t
p f f h o s p i t a l i z a t i o n J o n e A L e M D

M t G B t d i p t h l G n g n o f t h e S c o t u m
L n e f L d 9 4 5 4 8 4 6 4

I n a c a e o f - c a l l e d d p a t h e g a n g r n f t h e
c o t u m e n e r v a t v e m e u r s c l u l i n g t h e l o c a l
a n d g e r l a d m s t r a t n l s l f a m i d e
a d o p t d w i t h a s u c c s s f u l r e s u l t A m r u t a b l e
t e m l d b e e t e s e t e g e f t h e r
c r u m s i n c e t h i s u n l u b t e d l y a m a n f s t a t o f
i n f e c t i o n a l t h o g h a v a t y f g n i m m a y b
e p o a b l e

A n a n a l y s i s o f t h e 2 4 r p o r t e d c e s a s m a d
f m t h p o n t f e o f g i n c i d e n c b a t e l o g y
a s c u t e d l e i o n i g n s y m p t m s a n d c m j l c
t o n s p r o g n o s a n d t a t m e t

C o n r v t i m e t h o d f i t r a t m t a r e u f f e n t
l e s t h e g a n g e n e s p r a d s i c l y s n t h e c r o
t m r a p d i v r g a t e s n c o m p l c a t l c a s

C L E B A R O M D

O r m o n d J K C o t h r a n R M n d S t g l J A
O p e r a t i n f U n d e n d d T e t i e l J l l
B l t 9 4 5 5 3 6

T h e t h r s p r e s n t a t d v o f 6 o p r a t f
d e s c e n d e d t s t e l e T h e m a j t y o f t h e o p e
t (7 0) v r d e b y t h l a s t i c b a n d m o d f i c a t i o n
f t h B v a n p e r a t i o n I s s o f 7 0 c a s e s i
w h i c h t h t y p e o f t r a c t a u d u c c a s b
t a n e d n o t p e r e n t i a r s f 6 c a e i n w h i c h
n o t a c t n a s u s e d 5 3 p r e c t p r s n t e d s a c c e s s l
s l t T h e F e k t e c h n i q u e w a s s e d n o n l y 5
c a s s t h e r e f o a s t a t t e a l c m p r i t h t h
C b t v e s b i e l t c b a d p r o c d e v u l d b e o f n
f e

T h e t y p e l t r a c t o r u f e r o p e r a t i o n d e s c r i b d
i n c o n s d b l e d t l R t e c m a d e t b t h t h e
i n f a n t l n d d l t t y p e s o f b e n a l a c o c t
d t h t h e u n d e n d d t t c l f l n a a s
e c u n t e l i n o o f t h o 3 c a e

W x W S t r M D

MISCELLANEOUS

R y n t d L R n d W y a h H M U s e f
P n c i l l i n t h e T i m n t f U g n i t i l i n
f t n n J l l B l t 9 4 5 5 3 6 4

T h u t h o o u t l i n a p l n o f p e n c i l l n t h e r a p y
f u r g n i t a l m c t i o T h i s s t u d y i s b s d n 5 0 9
g o c c a f a d 2 6 n g n c o c c a l n e c t o

N n e t y g h t p r e n t o f t h e g c o c c a l g p
c u d b y t h i n t a m c l a r d m t t n f
o o o u t f p e i l l e v y t h e h u n t i

total of 80,000 had been reached or exceeded. For complicated cases 100,000 units are recommended. Of 2 initial failures in the gonococcal group 2 responded to a second course of treatment. Only 1 patient required a third course to effect a cure. No patients received penicillin.

The use of penicillin proved disappointing in the treatment of nongonorrheal infections. In the prostate and epididymis. However, in the case of tons of adenitis and prostatic space the drug proved valuable. In the latter case large dosage was required than in the gonococcal group.

WILLIAM W. SCOTT, M.D.

Harris, N. J. H., Botfield, T. W., and Trichel, B. E. Experience and Progress in the Treatment of Gonorrhea in an Army General Hospital. *Obstet. Gynecol.* (1942 to 1944) 17: 5, 945-964.

The authors review 77 cases of gonorrhea treated in general hospital. Ninety-nine had been treated elsewhere and had satisfactory results for cure.

Thirty-fourteen cases had been treated with one or two courses of sulfonamides. 5 (7 per cent) were cured and 64 failed to respond to treatment.

Five hundred and twenty-one patients were treated with sulfonamides. 35 of these received only first treatment and were cured spontaneously. 44 received further therapy and of these 34 (84.6 per cent) were cured. 95 were treated with penicillin with no failures.

Of 111 patients with gonorrheal complications those treated with penicillin responded rapidly.

Penicillin is the treatment of choice. The criteria of cure are important. They are: undetectable.

1. The patient must be asymptomatic.

2. The urine must be dry for one week.

3. Urinalysis should show no cellular elements.

3 examinations forty-eight hours apart.

4. The glass test should be negative.

5. The smear and culture of the prostate.

6. The smear and culture of the urethra.

7. The smear and culture of the blood.

8. The smear and culture of the sputum.

9. The smear and culture of the feces.

10. The smear and culture of the sweat.

11. The smear and culture of the tears.

12. The smear and culture of the saliva.

13. The smear and culture of the urine.

14. The smear and culture of the stool.

15. The smear and culture of the skin.

16. The smear and culture of the hair.

17. The smear and culture of the nails.

18. The smear and culture of the sweat.

19. The smear and culture of the tears.

20. The smear and culture of the saliva.

21. The smear and culture of the urine.

22. The smear and culture of the stool.

23. The smear and culture of the skin.

24. The smear and culture of the hair.

25. The smear and culture of the nails.

26. The smear and culture of the sweat.

27. The smear and culture of the tears.

28. The smear and culture of the saliva.

29. The smear and culture of the urine.

30. The smear and culture of the stool.

31. The smear and culture of the skin.

32. The smear and culture of the hair.

33. The smear and culture of the nails.

34. The smear and culture of the sweat.

35. The smear and culture of the tears.

36. The smear and culture of the saliva.

37. The smear and culture of the urine.

38. The smear and culture of the stool.

39. The smear and culture of the skin.

40. The smear and culture of the hair.

41. The smear and culture of the nails.

42. The smear and culture of the sweat.

43. The smear and culture of the tears.

44. The smear and culture of the saliva.

45. The smear and culture of the urine.

46. The smear and culture of the stool.

47. The smear and culture of the skin.

48. The smear and culture of the hair.

49. The smear and culture of the nails.

50. The smear and culture of the sweat.

51. The smear and culture of the tears.

52. The smear and culture of the saliva.

53. The smear and culture of the urine.

54. The smear and culture of the stool.

55. The smear and culture of the skin.

56. The smear and culture of the hair.

57. The smear and culture of the nails.

58. The smear and culture of the sweat.

59. The smear and culture of the tears.

60. The smear and culture of the saliva.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES JOINTS MUSCLES TENDONS ETC

Hatch R C H The De l pment f Sarcoma In
Bon S bj t d to R entg n or R dium Ir
radiati n J B S g 945 79

Roe tg n o ad um irr d t n suffici nt to cau e
p hel l chan es has he n f llo ed not inf eq ently
by the de l pment of rc noma Although les
common th n arcinom coma in s f rical
lce t on of a a lat d feld is also a well kno n
omplicat

The c r r p o t s in the l t rature of 24 p tients
wh d eloped bone sarcoma f llo ing exposu e to
d at on S t n of th e tumors res lt d from
o ntg noth apy f t be cul us arthrits On
foll wed similar tr atment f acute arthritis In 6
ca b sarc ma foll wed e pos e t rad um

Th re ca p r t d by th author are rega ded as
bone reom l t g f m th irradiation of bo e
fo earl r indepe de t tum rs amely a g ant cell
tumor of the tibi a similar tumor of the w t and
a cancer of the breast Two are chondrosarcomas
and 2 s a fibrosarcoma w th tumor cartilage

In all of the cases repo t d n the l t rature except
theam unt f rad at on w sl rge nd w sadm n
ster d n fract al dose over a long pe iod The
interval b t een the irradiation and recognition of
the rad t n p oduced sarcoma is l ng The
med an t me in the report d cases was s x years

There is the possibilty that th new t m r s r p e
s t rccur nce or metastas s of the o g nal t mors
I cases nd the intalles s were considered to
b beng p physical tumors Oposed to the idea
th t the s b equent sarc m e presents a regional
ecurrenee latent metastas of the pr mary tum r

th long t rval bef the arcoma was cv d nt
l case s n years and in ca e 2 l v n y ars
el ps d bet n the erad cat n of th h gn tum
and th app a t e of the reoma Als futi g
th dea of l cal rccur n e the fact that in e ch
case th s coma de el ped not at th s t f the
o g nal t mor h t n previously n mal bone
Latent m tastas s f om the o g nal gr w ths can
rdly be th e plan tion since the s d t mors
we cluicall d h tologically diff rent from the
gual es Mor ove irradiation suffici nt

dest oy th first neopla m h ld have d str v d
y metastas in the same fild In ca e 3 n
quest on f eg n l r curr ce or late t metastas s
can be as d because the p mary t m was car
inoma of th b east nd the late r b t m chon
d os reom The e m y be some d bt th t the
pot rperat v irradi t n ca s d th h tum

c app ently r l t v ly l t l r r d tion was
d Alo the r b a e a common t f chon
d ma nd h d os c ma wh ch ma gr v l ly
nd t p d c v mpt m f a l g t me II

e r chest r entgenogram made at the time of
ma tectomy tho gh not n w available w e r
p rted as normal l t as prob bly more than coin
e dence that chondrosarcoma develop d in a rib
within the fild irradi t d for carci ma of the
brea t

The presence of chro c nfection in all the ea ly
cases of roentgen s rcoma of bo e led most of the
uthors to th conclusio that irradiation of chro
ically i flamed t s e v as re sponsible for t mo fo
mation In th author s m terial cas and case 3
h we l no infecti n In case 2 there wa local bone
nfection follow ng ulcerati n of the sk n wh ch was
d to roentgen and rad m therapy Th infect d
t scc as n v r irradiated a d the ontgen sa
coma arose in h ne wh ch had not been infected

It is true that occa sion lly malig nt tumors
dvelop in chro call v nfectd bone wh ch has n t
been subjected to irradi ti n These tumors how
ever are us ally carcinomas develop ng in chronic
ulcers or in epith l ed sinu tracts Sarcoma for
mation in chro call v nfectd bone n t posed to
irradiation is xt emely rare

One of the most inte esti g facts ab ut entgen
ad um nduc d sarc mas of bo e s the large
p oportion of cartilage form g tumors Th s is true
of sarcomas p oduced in pe m ntal animals as
w ll as in human be ngs Ch nd osa coma occurs
m e f equ ntly amo g d i tion p oced sar
com th n m g other bone tumors

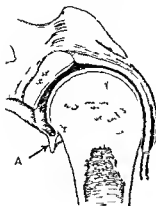
Jo n K NARAT MD

N via e J S Adh l Caps ltl f th Shoul
d A Study f Pathological Finding In P r l
arti ritis of th Shoulde J B S g 1945
27 2

Per arthrit s f the shoulde has l g been fam lar
to orthoped s geo s Oth r n mes applied t
th cond t on a e frozen sh l e stll n lpa
ful shoulde r pe iart c la adhesions tend nitis
f the sh t ot o s adhe ent sub crom al bur
sts scapul humeral pe r thrit a d Du
plays d s as The cl n cal p c t e is cha etc i ed
hy pain and lmit ti n f mot n in abduct n and
n both t mal and e mal r tation

The consensus of m st of the many v r t rs on the
suby ct may be ummed up n a few pe ntent stat
ments The cond t on s egarded as a separat
clnical tity Little is kn n of t path log cal
ch ngs a dexpos e of the bursa in few tan e
h revealed no con ist nt abnorm ltv Motion
w resto ed only fter dh s ons had been over
me Th dh es ons we e p o bably in the sul
stance of th tendinocapsular structur

Th t dy was und tak n with th hop th t
thro gh s gal e ploration of the sh lder jo t
om lght e ld be thr wn n th p th lgy f th
e dt n I such ca s the ope at v f dings



f th dh f (A) th d t d d e d t p t
f th cap l

t d and m r e d d m to
j ctures a ell In d d to 63 b lders f 36
pe n bod l f o m a causes e posed
at a t p y nd pec m n re tak f m cro-
pe study

With except on th pat nts s f t d fo op
t n ho d o ch ang n and b t th sh fd
j nt up r nt ng aph v m nt n Th e
cept on e ld al heat n n th h t tat
euff

Th h l d r f o pat nts uff fr m
f o n h lde p arthr f th h l d r
e xpl d at pe t n Cultu s tak n fr m
th j t e n gat In o ca s the cap l
as o t a d d l ly l be ent th b me af
h d t t nte f o p r t n Adh n
r d e ibl t th flect d f l d f c p l d
t l t th n t m cal ne k f s ca e th caps l
ld n t n p f e d g th m n p l t on a
true n th th e g cases l th gh n t al sp e t n
ant r rly ev l d it t he t After man p u l a
t on h e r th caps l could be p l d p f o e
ly f o m th a t c l a cartilage Th cau of ths
d f f e c c u l d n t b ual ed thr ough the pe
t c i n l n ca a te o s y n o t l the lo g
h d f the b e p t e d n was ob r v d

The t ns of burs nd c j taken t o m
th h l d r s l d m r c p cha es
th r b th h l d r s Rem t f t o f
a t c l r ca t l a e d co t u d f t r 4 h d
h n p c t r n s t t th the u t d g n r a
t ch ang fr m d e t e r

The e u l d m n r t e t h t h l e s o n n t a
p th t b t h t t h t t p t h g c l
cha g th c k e ng d t c t f th cap
s le wh c b m es adh e t t th h me at h d
M c o e p t n n th p e s f
p at f l m m a t r h g th sp t t
m a e s th e a l o m t h g i th l l
f th b c r m l b r s D r g m n p t t n f

f h l d u l a th th c l l
parated l o m th h ad m h th am v t t
adhes pla te n be to n y fr m th ba
k n O c th ep at has o c u r e d m t n f
th head w th n th jo t s fre
The t r m dh e caps l t suggest d a d
c u p t f th pathol cal cha g f f o a
h u l d e C s r p o t s p h t m g p h a
t m cal d c j t o and d n g s ar p e s n t c
R a l M t r x M D

SURGERY OF THE BONES JOINTS MUSCLES TENDONS ETC

M j e d g H W Th Tr t m n t f B n i g G t
Cell Tum r s by R t o n o E c i n d B n e
Graft ng J B S g 94 7 96

In 92 p r n t f th 4 ca h c h th a t c l
b d the pat e t b t t n n d f i t y e r s
f g e The h i s t o r y f a : g l e j v s l c t d n
52 per cent f the c e s n d o m l p l n j i s
per cent I 8 per c e t th s y m p t o m s h a d b n
p e r c e n t f l e s t h a n t h c y e r s a n d i n 58 per t
f l e t h n a s r

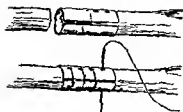
Altho gh the d g n o s o f b n i g g a n t c e l l m r
u l l y c a n b e m d o t h b f t h h t o r y a d
th e h c l n d r o n t g e o g p h e f i d n g s m i c r o
p e a m a t o n m o e l b l

C e t t a g f s a n t e l l t m r h u l d n s t f
m p l t c In r d t e m p l h t h i t
r v t h c a d r y h l d n d n p e n l g
e u b s t h t h f t h e l c n b d t e

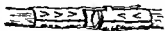
m n e l d e r v p a t l o f t u m t i s e m d
C m p l e t e m o a l i n r v F u t h m r th
s u g o n m t l t b n f h i t h e p o s e d
g r f t t b e b t a d u u a l l y t h g r f t t k
f m the t i b n b l a l m r f m a n d p o t
f m t h o l d b n A l t h g h t g b o
g a f t s p l d h m g g a f t s h a b e
e d t f i l l h u e d f t

A h m o h g m v c a u o u c m p l e t m s
n e e t w h c h t m p o b l t a t q e t
t h g a n s h o l d b p p d t p a k t h e t y
W h a s u c h p e d s t r y g a u p e k
m p g n a t e d w t h p e t r l t m a d s u l f t h a l
s e d a d t h d u s u t e d i l y e r s T h p e k
m y b f f t n p l c f k d t h p a t o m a y
m y b o m p l e t d a t t h e n d t a g M
e s e c t i n f t h n l d b a l l y p e r f m d
i c a e s n h c h t h t m t t d t h d
u l a f i b f W h t h t m l g d n l e s
t h t b o f m l g b n g f t s a q r d l
h a t h b t r u t s d b n g s g l i y
h a d t m t h t b a

The best u b t i n a h h t h
t p a c k d h m l w t h a t g u b h a l
w h m p l t t r d b m m o b i l z a t n f
t h t m t n p l t f P c a t l n c a e s
h c h t h t u m t t d t h g n f t h k d
t h a l l g h t b g h l d b i d t l
t h n t g g a p h m n t d l o s f f e t
d p o u n f b t t d t h t d t f



F



Fg



Fg 3

I Th l m thod t us s gl split b
th perf t t th gh whch t M be
pa d t a ch th di ded ds fth t d
F T pht tubes h bee sed wh h b t
ta hed t th t d f the t d d m in th by
aso f th m ll po ted p t (k k p) th
l m Th tw t b ca th be ted t th d
so h ld the tend d app um t d Th m thod

t v ry sat f t ry beca f the clips which w
q t b lg t th des f th t b
F 3 I th f test m th d tw sh t split t be th
k k p r co t d by rr w b d Th t d
d imply l d th pe d t be wh h them
l ed i th m Th y m b d ly so f
th k k p In th w yall t a d lip d
d th t be e d ly m d t th se d t ge f th
p at by p up the lit

w und s cl ed by sut r of the skin o ly A tiv
movements r sta t dne t day At th st p thes
can b d ne qu t v gor u ly t thout f ar that th
tendon ends ll me p t

So f nly r cent injur have been d alt with by
th s method nd f lipa : e mo e ments f th d gts
we e pre ent bcf the op ratio S cas s r
r ported

Two med an nerves we app x mat d by a m
la method the tube be g used to sur nd th
n rv but th sutu e d not p r f ate through th
n rv th y were p t n w th v y n small cu d
needles p s d tbr gh theed of th sheath f the
nerve and th n t t b ough the adjacent perf rations
of the t b on th same d and th n t e d o t d of
the tube

Plast r casts w e finally appl d nd at th
s cond tage th rve had unt ed w fl The e
pairs b en made too re ntly to al at the
f ct onal espns

Sta nless st el has be ome the m t al of ch cc
because th re v as ome d c lonizat on of t s e ad
ja t to th t l m u d

The utho conl d that th r ults w th th
method ha e be n f l y g od O f the a es of
d ns on f the fl r pollicis l gus was a c mpl te
succ s and the th r a part al f a l e

Th te hnical d t b may r q e f ght m d f ca
t ns n th fut P b bly the t es w ll b d
pens ed with and th split tub with f l l e harp
points p o j t n to t slumen (Fg 3) ll be d
nste d so s t cause th minimum f f a m t th
t nd n and p t the f rmat f adhes ns e r
th s te of st mo The de l m t l ha n t
vet h e f nd but f r th xpe m t a be g
m d th o types f t l s t l nd th r
all y R s F M r o m e MD

ORTHOPEDICS IN GENERAL

Leona d D W The S gn fican e f d l yed O
fscat n n th T tr nt f C g nical Cl b
f t f P d t S Lo 945 6 379

Att nt on has b en call d to th f ct th t del y n
neato o the t r al b ne m y be n mpo ta t
f ct n th o e a es of clubfo t h h b b
f nd t r lape f r o tmet eatm nt fo th sual
l ght f t m An ul s of a ens f rontg no
gr m from cas reco d has b n tab lat d and
c mp ns ba b en made by the s of a pro
p ed s ficat ion d x fo the foot The f cts th
htand d cat that d layed os ficat s pres t

an app ec ble n mber of the children hos
t eatme t h s n t b u c ssful by the p e e t
c ns r ati method Medicat on w th thy od
ord r to acc ler t bon format on h b n g
gested a a d j ct to the us al o tin f su g cal
t atm t The co t e du f the os fic t
dex d r g t atment h s b en d cat d as a
m n of d t m n the e d f r m d cat n th
p gress u d t eatm nt nd the l timate p g
o s

If the p ocess f o fscat the tars l b es
hold th cle to th p oblem f t e tment fo cl b
f o t a d f the t atment t b th ght of a first
a c r ct of th def m t and e d a pe od of
wa ting f r th el ments f th f t t th
p p sh p lke l gpl t ic th i d i dual t me
h d l e f s neaton s f p u m a m p ta ce l t
ill n t be n ght y f m th m at n of
e x ay n gat nt t the al n mb of os f
cat on nt s p nt t l l be nece ary t sho
hy peated t g e g m that th n w c t r s
r p e n th ut d l l th t i n f m
these e ters p gres ng at th mal t

For the normal foot the average ages for the extremities are normal, but for the appearance of the center of ossification:

Calcaneus
Talus
Cuboid
Tarsal
Carpal III
Fibula
Carpal I
Carpal II
Navicular

B
B
B

3
4
4

Each of the average figures which admittedly are not averages may be taken as a borderline age beyond which delay is definitely pathological.

Cuboid appears at least twice as often in boys as girls. It has also been noted that the rate of ossification is a normal average in boys, slower by a little more than in girls. A relative slowness of normal ossification has rarely been found coupled with arylate dysmetria and clubfoot.

Traditionally, most likely to be successful if treated early in the child's life. This fact is of interest in the present study because it definitely places the orthopedic surgeon in the time to treat the child with the possibility of a high rate of ossification of the bone of the foot in place. The physician is faced with not only a rapid process of ossification during a most critical stage in the treatment of clubfoot.

If repeated observations of the ossification in a case under treatment show normal ossification, a diagnosis can be given. The finding that the deformity is not so likely to reappear after the cessation of active treatment.

Chondromatoid tumors are seen when clubfoot will change the degree of appearance and retardation of the ossification. Of all the metabolic disturbances, the most frequent is

endocrinopathy are the most not only and of these hypothyroidism has the greatest clinical significance. We have concluded that calcium phosphorus and vitamins are important food elements in bone development.

Endocrine changes in addition to delayed ossification in cases of hypothyroidism emphasize the importance of that endocrine gland. In many of these cases the bone changes reach an extraordinary significance as cretinoid dysgenesis. The chronic calcium deficiency evidence that after the usual delay in appearance of ossification finally develops from multiple centers through single bone and mottled type of ossification is the result. Under therapy with thyroid substance these abnormalities rapidly become normal and line centers that appear and get cemented into normal.

The fact that thyroid medication for periods as short as six months will bring about rapid normal ossification in these cases which this evidence may be borrowed as a basis for the medical treatment of any patient in whom delayed ossification has been demonstrated. Thyroid medication is then indicated. The natural fear usually associated with the use of thyroid substance is a patient with a supposedly normal basal metabolism may be misled by accepting the fact that delayed ossification is in itself good evidence of a low endometabolic rate. This finding substantiated with x-rays therefore is an indication for thyroid secretion unrelated to the treatment of clubfoot. Medical treatment for the purpose of speeding ossification in children with clubfoot through the period when the bones are being laid in their normal position thus become a matter of giving adequate daily doses of thyroid substance with extra thyroid extract of which this medication demands and with the ethical assistance of detection of calcium phosphorus and vitamins. A and D.

R P M. TOWNER, M.D.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

H nt J B Jlgatu f the Patent D ctu
Arteriosu B f H J 945 73

Fourteen cases h hlg t of a p t t due
tu a te us a p f r m d a p o t d T l
e unc mplicated by nfect on ard n hly a
d ca d t s p e e t f f the pati nts e f
mal s The g s va d bet en f i and th ty-one
yea s l th un omplicated ca es the pati nt r
all slghtly stu d n gr th the major ty r
bre th l s s e r t i n nd l y r h ed s gns of
cyanos

It s to soo t kn hat the ult m t r s l t
i these case l l b All f the p t nt ba l t
the r dyspn on e e t i n and hav mp d n
g ne al h l th a d phy iqu l om ne to thr ye r
postoperati ely Th r k att dant po th pr
nc of an uncomplicated pate t ductus r r
ba e o t y e b e accu at lya s s d but that th e
s a de f i n t k o f i c t o i th a g a p o m s
is nqu stion bl

Th t v ng of the d c t s t th pati nt
c c lat o t n n l th b e th l s e d sapp ars
th app a a c e ma k dly m p o e d and a o t i c
able ch e f r the b t t r occ r the pati nt
me tal c d t n

Th op rati e t chn qu d i b e d
S m f M D

S n J H M rphy G E d N w m n E V
Multipl Cong n t l Art r i e n An r y m
in the Pulm n ry C l culati n B H J h H p
k n s H p 194 76 93

A cas f mult pl c g n t al art r v nous a eu
rysms i th p l m a j c cul t i n pr s e t e d
The d s g n stabl h d by an i o r aphy as
f i m d at aut psy a d th patholog cal find s e
r p t e d

Th clin cal p tu of 6 r p o t d cases s m
m n e d Th s l symptom e kness fant
n and d z n s dyspn h st pa n and h m p
ty is Thes r c y n s c l b b n g f i th f g r s
f i e n j b l h mang omas bruto r th ch st
p l y c y t h e m a d x y e d e c o f a l c a l d
p l a t y n th l n Th e s can be d f i t l y
establ sh d by an i o r aphy Th t e t m e t s p u
m n e t m y

A b i f d cu s s g v e f n graph c t ch
n que nd the phys ol cal f f c t of pulm n ry
r t i e o u c immun cat n Angi phy ha
pr d us f l pro du h t may b d a g r u
n a pat nt th c r c lat r y shu t f m h t
l e f t h art

A clin op th log cal ly m d f p
usly p o t d c s e s to e t h r w th th uth s
her report d m h h d ath o u d th n
t u o f th ntra ye t t n o f d i d r a t f

d g o Th c l s r ach d s that the ntra
e s u f d f r s t sh uld be p p o ch d ith
ca t o n th ca e of pate t w th h p e t e
ca d o e n l d s e J i t k i x a n i c M D

Hlodg G B Grims n k S a d Schiebel H M
Teatm nt f v a l v by Stripp g E
c l i n d e u l i o n A S g 94 73

High aph l g a t n v st p p g d th r
e c n vul f the e th p u
b d g nd a l y act ty ha p v d f f c t
i th t t m t f a g r u p of pati nt th ad
an d path l g cal cha g s o c a t e d i th l b
v s c Th y r e m e f f i e t h a l g a
t n a d t j e c t th r a p y s l e a l i n p a t e t
th m l a l a d c e d path log al cha g Al
tho gh the op at p s d l a g a s f s k n
a d f i e c a e d o u t n th p n e f o p e
ulcers th at f n f c t n l

P r banda a d e l y a t t v m a c u t
fo the b f p l m a v n b l s m d p n
th omb s

Th app a n c f mall ar cost a
half f i b e p t i t i th h r i p o d g e t s
that s m d f c t of th r m a g o b m l
t y f a c t u a t m s t l l i s t

S m k i M D

Smithy H C C mplicating F t r l th S r g l
cal M n g m e n t of v r i s e v i s S g r
945 17 50

Sm th y p o n t s ut that s c e f l i t r a t m n t of
arico n f the l g d p e n d u p o m p l t
o b l t e t o n o f the p n l c m p o n t f t h e u p e
n c l e n u c r u l t n d m p h a z th t t e
b e t r e u l t s a e b t a n d o l v by a d c a l t ch n q
H h i g t u a n d d s n f t h p h n u
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H d s c u th a m p l e c t i n a d l l
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R e c t o n s t s e l o s g g e n t l d c d
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O N H E E L i g t n o f th l f r i v a C a v a
i n t h e P t i d T r a t m n t f P u l m r y
E m b l i s m v E g l d j M 94 3 64

Th t r u p t f d p n p t l a y s n th
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turbant influence of constant low g of the oxygenation in the inspired air

The polycythemia associated with the anoxemia of high altitude is absolute in type. The elevation in the total blood volume is due to an increased red cell count. The polycythemia observed in animals at high altitude seems due to factors of decreased red blood and hemoglobin in the blood that cause a response to a repeated re-exposure to a low pressure environment related to a erythropoietic hyperactivity.

The polycythemia associated with constant or intermittent anoxemia tends to show a proportionate elevation in the circulating erythrocytes and in the serum bilirubin. The stimulation of the erythropoietic system restricts the formation of the hemopoietic system restricted to the formation of blood cells and the hemoglobin. Chronic anoxemia does not modify the erythropoietic activity permanently.

Comparative study of the polycythemia of high altitudes and that observed at sea level indicates that in cases of the latter due to pulmonary changes the polycythemic response tends to be less than with corresponding degrees of arterial oxygen unsaturation at high altitudes except in cases of asphyxia of disease. Such comparison also suggests that the causative mechanism of polycythemia is not related to the existence of a specific stimulus.

WALTER H. NADLER, M.D.

D. G. Wain, E. L. Th. Possible Role of Whole Blood Transfusions in Military Medicine. *J. Am. Med. Ass.* 1934, 7:137.

Since the introduction of the transfusion of whole blood into medicine has steadily increased the use of whole blood until it is commonplace in most hospitals. Blood has become more readily available through the development of blood banks and it is commonly believed that due to its use the number of amputations, operations, and deaths from hemorrhage have decreased.

Since 1938 attention has been directed to the therapeutic possibilities of plasma and serum transfusions. These plasma transfusions are effective in the treatment of hypoproteinemia and of secondary shock. The army employs them in immunotherapy. There are many questions concerning the origin of secondary shock, but nearly all agree that the important factor is the loss of the circulating blood volume. Whole blood will do this but many workers now say that this is not sufficient and entirely to the plasma component is a doubt. The erythrocytes are unnecessary and unstable and dangerous in the plasma. Plasma possesses the advantage of whole blood of being more stable for storage and not requiring compatibility tests prior to administration.

With military interest in the use of secondary shock on a large scale many opportunities for comparison of the two procedures are being obtained.

Apparently that the method which is effective in civilian practice we do not necessarily apply in a warfar. In civilian practice the degrees of shock are mild or moderate and treatment can usually be instituted promptly but in war the degree of shock is often much greater since a longer time elapses before treatment is started. Fully recognize this probably accounts for the fact that the inclusion of plasma treatment with hemorrhagic shock could be treated exclusively with plasma or serum.

It is now being recognized that there are several distinct clinical types of secondary shock—none in which the monotonous occurs as seen in burns, a decrease in gaseous and another in which hemorrhage occurs as in shock. Catecholamine hemorrhage. Serum and plasma will restore the circulating volume in both types but if the blood loss has been great the plasma is not necessary to a drip, unless whole blood has been administered. But the latter treatment of casualties concludes that the loss of blood should be given for a few points of serum plasma—no observation on subcutaneous infusion in the American forces.

In civilian practice the University of Iowa Hospital in 1930-31 had a general hospital with a blood bank having quantities of whole blood and plasma available. One can gain some perspective of the difficulties of whole blood transfusion in one year's 1938 transfusions were administered—17 whole blood, 335 whole blood and 60 plasma. Only the indications for each transfusion were recorded and of the availability. It may be possible to predict the duration of whole blood and plasma; an exact military installation from this experience because the patient is still being undergoing major surgical procedures and the incidence of secondary shock is still great. In military medicine 50 per cent of the cases of hemorrhagic shock are caused by hemorrhage and a condition of peripheral vascular disease.

Frequently in warfare there are many practical limitations to be faced. The ease of administration, stability and general compatibility of blood plasma are well known. These factors make it the preferable time of secondary shock. The military situation is that the question of plasma is not the whole blood transfusion is not practical. The military situation is because of the time required to collect blood and the lack of quantities in the personnel and equipment and the difficulty in procuring donors.

Emphasis of the following points produces has made possible the application of whole blood transfusions in military medicine (1) the accumulation of the gestation of the red blood (2) the transportation of the red blood and (3) the administration of the whole blood. The points being given any of the following:

A zone of risk in a hospital with a blood bank will require supplies of whole blood and stable labels. The gauges the administration and the potentialities of the administration. These administration are in the personnel and the administration.

establishment where surgical operations are performed on seriously wounded men by a limited personnel.

Transplantation of preserved blood now is limited only by the distance attained by airplanes in the maximum time of preservation of the blood. The United States Army has maintained daily transposition system of blood from a coast to the European theater of operations.

Obtaining in 1912 proposed the universal donor principle of considerable controversy about its feasibility has been aroused. Rarely a blood of group O may contain agglutinins of such potency to react with a component of a heterologous group. Therefore transfusion of O blood has been given to recipients of other blood groups in civilian and war practice without an immediate incidence of reactions. This is an immense advantage in military medicine. The group of the blood can be determined at the point of collection by trained technicians and then it can be employed as determined by its plasma at the point of administration without the delay equipment or personnel required for the laboratory tests. Not only satisfactory but also it is safer than the trusty compatibility tests done without the presence of urgency which frequently surround the emergency transfusion of blood.

Military organization must solve certain new problems in handling preserved blood in addition to the problem of supplying plasma to medical installations. Collecting depots must be established far back in the rear to insure adequate donor supply. Depot to be equipped with facilities for adequate blood grouping. Refrigeration must be provided at the collecting depots during transportation. Distribution of supplies is accurate by time and need of recipient transposition facilities must be maintained. However now that these problems are being solved by the American army it is now possible to employ preserved blood of group O in the same manner as plasma administered in civilian medicine.

R. T. R. B. 10 M.D.

Th. H. W. T. Y. E. S. and Sh. U. T. S.
Th. Tra. f. n. of Centrif. d. d. l. m. n. Type
F. O. Cell. Res. pend. d. d. St. ed. in 10 per
cent Corn Syrup. J. Am. M. A. 945 7 096

Resuspend dried blood cells 1 ft after treatment blood has been centrifuged and the plasma with drawn has been added in 10 per cent corn syrup at 5°C for as long as two to one day and administered with satisfactory results to 437 patients (figure 1) the experimental intravenous infusion in four days has been established.

Jau. de. o. a. y. o. t. h. r. del. t. s. f. e. c. t. has not occurred and the influenza fever chill effect on rats is corresponded in the different hospital that from the own bank blood.

These centrifuged cells were fed by Ashby's gelatin test which were well digested in the recipients' culture as well as whole blood in a

definite citrate mixture which has been stored for the same length of time and longer than cells in isotonic solution of sodium chloride.

When the red cells are added the clinical results also indicate that transfusion of centrifuged cells resuspended in 1 per cent corn syrup is as satisfactory as transfusion of whole blood.

JOHN W. B. VAN M.D.

M. Th. R. O. Concentrated Red Blood Cell
Preparation and Use. S. H. U. J. 945 38 33

As a result of the increased demand for plasma blood banks have been left with large quantities of erythrocytes which have been discarded. This has resulted in a 5 per cent loss of the total material collected. Attempts to utilize this material have resulted in the development of several new techniques. Utilization of erythrocytes.

1. Red blood cell suspension

a. Dilution—1 cc equals that of whole blood

b. Concentrate—cell count doubles that of whole blood

Red blood cells as surgical dressing

a. Red cell sludge

b. Dehydrated cells (powder)

c. Treatment

Red cell suspensions are those in which the red blood cells are suspended in saline solution to concentrate in proportion to that of whole blood.

Concentrated cell suspensions are those in which the red cells are present in approximately double the number found in whole blood.

These suspensions are used as dressings for wounds.

Cells used for this last purpose may be prepared in one of three ways: (1) a sludge which is packed on the wound; (2) the cells are dried by lyophilization and used as a dusting powder; or (3) the cells are incorporated in an ointment as Tragacanth, a diethylene glycol have been used as a base by Murray and Shae.

The preparation of the red cells for surgical dressings is relatively simple. It consists in removing the plasma from the cells and then drying them by process described in the thoracic laboratory and present a modification of the current procedure used for this purpose. The particular arrangement used all was the complete drying of 350 cc of cells in approximately four hours and makes it possible to dry the cells in amounts in one working day by multiplying the apparatus which is sufficiently simple construction to permit application one may dry considerable quantities daily. The powder has been found very satisfactory as a dressing or as a 5 per cent ointment in a special basic ointment.

of the following

Cetyl alcohol	15 gm
White wax	gm
Polyethylene glycol	gm
Sodium lauryl sulfate	gm
Water	72 gm

B. JAMIN G. LEMAN, M.D.

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M S b t t t Pelimin ry Repa t 1m J W
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b l t y J i M A 945 767

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o t o n l y t h r c h k g o f t h g p s d e r
m a t h n g b t a d d t h e h e m c a l e m a
t o f t h b l o o d a d u r a e l l a t h d t r m a
t o n t h e u r l i f t h t r a n l y e d r d b l o d e l l
H F T a c a s o M D

RETICULOENDOTHELIAL SYSTEM

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S p l n t o m y 4 J M S 945 09 56

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f l u e d m n f p a t t n b a l d b e t
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M r J S HERR MD

SURGICAL TECHNIQUE

WAR SURGERY

H I R I War W unds The Pre ent Statu f
 Th l Tr atment C od M A J 945 52
 45

Infection is the distinctive problem in war wounds. The first important contribution to wound treatment made in the years between the two World Wars was the control of infection due to hemolytic streptococci. Since these organisms were secondary invaders which always came from the nose and throat either directly or indirectly, infection by them could be prevented by application of silver or hypochlorous acid to the skin. Part of the merit of W. Bennett Orr's closed plaster treatment was due to the exclusion of secondary infection. Second in importance was the introduction of ulfamid. The third contribution was Traut's closed plaster technique which applied W. Bennett Orr's method of treating otitis media to the treatment of war fractures. This technique not only excluded secondary infection but also enhanced the development of local defenses by splinting of the soft tissues.

In this war period has been found to be a magical. The essential features of the management of war wounds now are

1. Early and adequate debridement. The wound is enlarged by longitudinal incisions which eliminate infection and provide adequate exposure. All devitalized tissue and foreign material is removed. Perfect hemostasis is secured.

Draught is produced by stirring vaseline
sticks into the depths of the wound

3 Fractures are reduced by manipulation. Steinmann pins or Kirschner wires are inserted if necessary.

4. Plaster is applied—it should cover the wound and its dressing completely.

5. Penicillin and sulfonamides are administered orally and intravenously.

With such methods it has been possible to elicit about 8 per cent of the sounds within two weeks of the wounding and to have the great majority of these heal by primary union and manhandled

SAMCE K HV M D

Edw d H C Re ival of E ly Wound Cl su
Tw St g Operati n as Appl d in It ly
La t Lo d 1945 48 581

In Italy in the los g ph ses f World War II
t atm at of the deb ided w nd hy delayed closure
aspract c das a outline pced prim ry sutu
b i g re rv d f r wound of th fac d sc ip
Th e m t stage op ton h be u d to d
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t on a ha i g a l a or of p op ag da it has been al
the mo u ful: the fi k b cau it is som thing of
a glog n More ve it yu tified by th followi
facts

When a missile enters the body not only does it provide transport for pathogenic organisms picked up as it passes through the skin and clothing but by damaging the tissues it creates an ideal home for these organisms. The object of early surgery is to wreck this home and make it inhospitable. The forward surgeon does this by removal of clot and foreign bodies by excision of grossly contaminated and devitalized tissue and by providing for unimpeded drainage through free incision of the skin and fasciae. He will further increase the inhospitability of the wound by using a bacteriostatic. The success of this initial operation will be apparent in from two to four days if there are then no signs of acute inflammation on the wound around the wound the object of the operation has been achieved.

Aft th d ed r lt—a w d hch has re
sst d attack hy the org nisms o ginally introd ced
—is ohta dy the ne t ohl gat ns are to get the
wound he led m mmn m time and to p event r
fect on These obligations are of course closely
relat d Both may hef kill d by closing the wo nd
which m y s fly he done when there are no signs
of inflammat Noth glde dea now he gan d
hy leavi g tw l p n and much may be lost
Th p nce of fracture is no contra cat on n
the contrary it makes early cl even more desir
able

Thus the whole operative procedure may be conceived as one operation performed in two stages—a preliminary debridement to guard against suppuration with a waiting period to determine its success and suture practically between the third and fifth days.

From the pooled experience of senior surgeons who had served with both the Eighth and First Armies a set of rules was drawn up.

1. Débridement of wounds at forward units must be thorough.

2 The d g on a w d must noth distu b d
dur g v cuat n f om forward units to base
hosp t ls unless th and cat o s for d ng so are
ab lut

As the rule which has been hardest to enforce, the rule that a soldier for a clean dressing is a natural pulse difficult to resist. That insistence upon this rule justified has recently been shown by Lieutenant Colonel Bentley and Major Scott Thomson who find that 48 per cent of 163 wounds dressed during the acute phase were infected with pathogenic bacteria. 33 per cent of 60 and sturdier wound

3 The first dressing must be done under asptic conditions in the operating theater the optimum time being from three to five days after the initial operation

4 The wound must be closed at once if it looks suitable bacteriologically; otherwise it is neglected as a criterion for closure.

5 Th j at i mu t b r ta ed i th bo p tal
untl the t re e m d

This last rule i f con id rable imp t c l
mall ri so fa fd layed sutur acu tel f m
h p tal ca tern It ly t h p tal in western Italy
afte the b t l of the G th L ne the c as a h gh
p ort n of failu s

The pportun ty to ca ut d l y d p m ar v u
t r n l h seal cam at Ca th D la
for whi h a M a r \ bett rooportun ty c ld
ha e pre ent d t l f s th m l cal arra g m n s
n th s battle ver p obably a f vora ble to th ut
come f s r ry as th i a y c mp n h tory
For a d b ho pital e only f ho rs a way
f m th fr nt l ne d bel r ad qu te n num
be During the v t n d y f om M y 15 t
M 33 fl h ounds i 3 pat nts rer pa ed
b t e n th th rd a d th day l v unding in
gh teen d i fte nt gene l h p tal Of 610 ca es
r p c t e i h t b a c t i t u as used 530
(84 p e c t i) s h a l d b y f i n t n th n
t e e days Of 9 as s 8 (9 p re e n t) e
adju d g e t ha e b e t l s to p e n t c c sul
Of 234 w i d n h h p e c l l i a s u d b th
sta s of the op ra t o i 9 (89 p e c t i) h l d by
fi t i te t i o

With e pe ne surg on b came b l l r and th
num t f und l r i d t d c r a d T h
rul s first nume t d m h m n t s e d l e d
Imm b i t on du i g tran t one f th m A
pla t r p l n t s n o p p l i t l l m b i m d u
g acu at h e t h r o r n t a f a c t u r p r n t
Th h a t h add d val of d e t e r g t h s t m p t e d
t d g r d the e t o o s p e t o f u d Th
t m u l u s t f o d s u r r y a f f o r d d b y e l y l u r e
h b c o n s d a b l S e a f f r s d u n t s
h e l o t a n y r e l u t a n c t h e y m a y h a d t o m a k
a d e q u a t e k i n c n f o r e p u e o f t h d e p
t r u c t u r e s b c a u e t h e y k n t h t h n a f e
d a x t h e c o n w l l b l d b y t h e c e l l o u s
a t t h e b a e A n d t h e e x c e l l e n c e f t h e f r a d
g e) k h g e n i n s r g e n f i d n e t t h
u h t t h e b s e n t h p s o f r e p a r

F e c l l l k l l t h r b a t e t t i s i t h h a n d
m a l e o f u g r y I t n e e p l e s t R t h
h o u l d t s t i m l a t r g t b e e m o m t c
l t h t h r t h q e C v e r a s o b l e c n f
t a d t h a d f i c l l n t h e y h l d t h n i
f a h t h a m a s u b l d s t a n c f c o p e e n t
c e t h t t a g p e t

Th t h n q f r d b y d i f f t r g l l
f r c n s d a b l y l t i u g h t h d f f e n e r m r
t r n t h m Th p t n t t a k n t
t h e t h a t l l t h f a s t a r e n t t h b a
h r t a l t h a n h t t i l T h e f
t h m a d i t h i t p a u t o s a l
f c t r a n s t u m a k t m p b l
m y d t f n t t h a l s t h i a n u d
C p r f l d n t h h a b e n a l q a t l
d a l t t h t h r e t s t g e - l l y a l l f t h m
h b n - a r d t b d a h t l p o s b l A
i r e n h r m l f t b f

lone aft th bl d e l t h a b e n g e n t l y r e m o j
Th d g e s f t h n d a r e p a r t e l f o m t h
d r y n s t r u t u e b y b l u t t l t a n d b r o u g h t
t a t o a p p o t n b y t r u p t d t u e s I t i m y
t a t o a b t n a c c u r a t p p o t i o n o f t h s k n d g
I n d e p e r o u n d t h t r a c t e x p l o d e d n o t o n l y t
m a k e s e t h a t r e i s i n n e e d e d b u t a l t
p p a e t h s t f r t h e r c e p t i o n o f p e n i c i l l t u b e s
D a a g r a r l y e m p l o y e l e c p t a t t h e a n l
f t h e s u t u e l e f a m a y a m p u t a t B u d
u t u a e o d d a s i r a p o s b l e

W t h e e r f c t p e a l l y t l e o f t h e f
m u r t h r i s t l c y t o l e l a s u t u t o b t n
t h e s i t h a n d t e t h d y d i n o n o t h p d e
t e a l a r g p t r f t n i s f q u e n t l y u s e d T h
h v e r i o o f t h m a y i a t o s u d m g
r g A c r t a n a m u t f t s p m t l i
b t h s k n l i c d a b l t h e d g a
b h t a s c l o s e a s e m a d t h p t
c m p l i t a f t e f i v d s b y h c h e m t f s
p e s i b l t s e u r c l s p p s t n W h k n o s
g e t - b u e f p r m a y l s t c t n b t h e m
s l f f a r d s u h v r c o n r v t w t h
s k i - a s m p l e d a y m a x b u t o r p h l l
m a x b p d e d b y i m m d t e p a t c h k n g r a f i s
A f e o p a t n t h l m b f a t r e f a d a s a r u l
t i t l t u b l l r t t e l d a y a f t e h h
t h s t h e a r e r m i t h e o p e r a i n t h e a t r
W t h d p e r u n l h o e f t h e t e

a f t e l u r e t i n e a g l y t h c u t m t m k a n
n e m a p e c t s n t h o p r a t n t h a f t f i e
d a y \ d r p e c t o a r p m t t d
t h a f s A p t t n b o t h a b o n b l t h e
k e a r e p a t u l a l y u d f t h t e h q u e o f d
l y d s t u e l r d d n s t i c k r g s e l
a t t h e f i r s t g t h e s c o n d s t a g e e s m p l e
T h b s t t m e s f t p j s t b e a b t t h e f t h
d a y b t h f l p m n m b l n o g h o f r y s p
j m t u t t h t h l y A h r n i e d
h h s m d t h p r a t g t h a t r t h e
c l t h d l l r y f r e c t s n
f a o c u t a f o t s o p e c t a l
g a s b t a i n s t d a l l u t n n t c o l -
l j M D o u l l W d l l g t t h e h n i a r
a l o l l s u t d t h d a y d u t u e t h e r c
W h n a m p t a t o n f t h h n g r s s n c e s r v f r
a r d s t p r r l l f t h e b l e k n e
t t h b f l b t h a g o d f l p
a l y a n l t g t b u j b y t h e g a t h e
b a l t h m m r f i l r u d - p e
a l l y m j a t t i t t h e r p o t c
f t h l l o d i t t t b t h t r i t h
t c n t t h m l b t h h m t r t l
a d t h p l s m a t t l l h i t a l q u i j d
t h t l t s f i v S i k f l a m p r o t
m t n l l d f a i t d b b l o d
t a f u b l t h i t h f t h p d r e
a t t m p l e d

The m l l r t a h i s
i A n t f l a m t n t h u i r l t h
t e r l t h t h i t b i e n t
n o t A d t n t n r l y u

suit d f any uch unl sh v nos g of
 flammati and pv g c organ sms ar n t
 m rec mmonly found in th m than in w unds
 ch look clean

Th preenc fgs th ts ues

3 A e s i c l s of sh

A delaye s t r e h ch is l ss than 50 p r cent
 s cce ful reg del a a fa lu The common
 ca es of f lura c e s f ten ion at the suture
 l and p — r both The p po tion off f res
 w ll a y cons d bly acc ding t the craft ma
 h p and l dgment f th su ge s l f l e s com
 p le a l att mpt may b mad afte r el m

ary local treatment us ally th penicilin I
 pa tal fal the unheal d area m y be covered
 w th patch g ft I othe cases ag in it may be
 b t t a t a c k more d p r i o r m a s o d

ary t Thist m ued to d c be the oper
 at n q d he th m during h ch d laye d
 p m a r y s t s l l possible (s l l less t t n
 d y s) has l i d l t i d c a t e d t a y t m e f r o m
 f t e e t s i x t e e n d a y s l a t e r Th g n l a t i n t i s
 s r e m e i a n d t h s k d g e s a r e c u s e d I e f

f t t h l d u h a l e d o u d s r p l a c e d b y n e w
 t h h m m d a t e l y c l f O f t e a f l a p i s
 d d n d f t h u d s l a r g e a n d q e m o r e
 t h t a a g k l l f t h e g e r a l s u r g e o n t h c a s e
 t r a n s f e r d o o f t h w m a h o f a c i l e e t r s

the Command Occ s o l l y f a l e s d u e t o t h e
 t n o n o f u n s u p c t e d m t i f g m e t a l o f
 r s e s o m e t i m e t o s e q u e s t r a b u t n o d s a l

l d t o r m a i n b e a l e d w t h o u t g o o d c
 A t l e a s t f r m 7 0 0 0 t 8 0 0 0 w u n d s m o n g
 B t h a d i d a f f e c t s a n d m e w e r e c l o s e d b y
 d l a y e d p r m a r y t r e r e c o d a r y s u t u r e b e t e n

M y t a d t h e d f 9 4 4 Th d a t a h o w i
 t a b l i r e d e d f m n a a l y f 3 8 4 5 p r o
 f o r m a s d s g n e d f t h e v t g t n A g h d
 r s n n t o t h r e t a d a d f h a l g h a b n m a d

G a d t h f m o o t g o p c n t h l n g m
 p e d n i s h e a l e d b y f i t i n t i n o w n d
 h c h d r y f t e e d y f t s u t u b t n
 h c h a m l i p t f i t h u d o t t c h h o f e r

p e l l t h o l e a s h l u n d a c a l C a e
 s t k n t o n c l d e b u t p o v d c a s u n d e r
 t h h d g

G r a d I f w i t h f m 8 g t s p e c e t h e l g c o m
 p d d s w h h e a l d f t h g t p t b u t
 h c h t r e a s o m e g a p d c h g (p e r

h a p t h g h s t i t c h l s) f s e u m p M t o f
 t h e s h e l d p o t n e l y t h a h t t m o
 d e d h l p r o m p t c h k n g r a f t

G r d l i f c w t h h l g u l e r s p e r t
 r g a d a f l M t f t h e m e r e h
 r l y l t f i l e s f e b k e f w c m

p l t l y
 I t l l b e s t h t o f t h e c e s t r a t d b y d f y d
 t p e t e r f r a c t s h s f t h

c a s e s t l b y c d r v s u t p r c t
 f c t Th b e c a u s e h g h p p t i n f
 f a c t u c a s a u u t d f d f a y d t n d
 b e c a e t h t s a l g h t l y h g h p o p t n f f f

TABLE I —PERCENTAGE OF HEALING IN
 APPROXIMATELY 18 000 WOUNDS

		De la d P m r y				Sec d r y S			
		T t a l	G d (00- 90 ^{cr})	G d (11- (80- 90 ^{cr})	G d (11- (11- 90 ^{cr})	T t	G d (00- 90 ^{cr})	G d (11- (80- 90 ^{cr})	G d (11- (11- 90 ^{cr})
All	d	5	(6 (3)	(5 (6 ^{cr})	(5 (6 ^{cr})		(75 (67 ^{cr})	(6 (4 ^{cr})	(35 (37 ^{cr})
C mpound frac			(7 (7 ^{cr})	(5 (5)	(9 (9)	60	(6 (6)	(7 (7 ^{cr})	(7 (7 ^{cr})
Fl h	d	5 006	(8 (8 ^{cr})	(5 (5 ^{cr})	(6 (6 ^{cr})	5	(68 (68 ^{cr})	(75 (75 ^{cr})	(7 (7 ^{cr})

re of d laye d t u r e n c o m p u n l f r c t r e s s e c
 n d a r y u t u r e b i n g f r q u e n t l y a t t e m p t e d h e n d
 l a y e d u t e h a s f a i l e d A s u c c e s s f u l d e l y e d s u t u r e
 l o k s i t s b e s t f e d y a f t e r t h e s t i t c h e s a r e
 m e d A s t h e w e e k s p a s s t h e s c a r s p t c u l a r l y o f
 t h e l g r o u d e g t r a d a t e s c a r s o f t h e b u t
 t o c k o f t e n d e v l o p a g o d d e a l o f k l o d f r m a t n
 d b e c o m e r e d a n d u n s i g h t l y O f t e n t h e e p i t h
 l u m g e a s p e c i a l l y a t t h e c t f a c a r s r
 o v e r t h f i b r o u t c k l i n g f o m t h p s s a g e f
 t h e m s s i l e S u c h s c a r s a r e v e r y t r o u b l e s o m e t h y
 m a y a l s t d e f i n i t e l y d e l a y p a t e t r e t u r n
 h s n t n e a t g r y l S m o t h e a n o b g
 s u b j e c t d t o f u t h e r e x c o n o f t h e s e a r t s u e i t h
 i m m e d i a t e r e p a r The r e l a t i o n b e t w e e n t h e a t m a l
 c a l s i t u a t i o n a d h e a l g t a s n e v e s t i g t l y b y n
 a a l y f t o o o n s e c t i v e c s s i t a s n o t e d t h a t
 w o d o f t h b t t o c k w r e t h e m o s t t r a t a b l

U n d e a l c o n d i t i o n s t h e s e r s l t c o l d b e v e r y
 g r e a t l y i m p r o e d b u t d e a l c o d i t i o n s n e v e r o c c u r
 i n w a r I f t h e y d d t h w o u l d b n p r o b l m n
 t h e t r e a t m e n t f w a u n d s a d p r m y s u t u r e
 c o u l d b e u s e d a t w a g o p e r a t n w o u l d r a r l y b e
 c e e d e d I t f c t a g a i n s t t h c o n d i t i o n s c r a t d
 b y w a r t h a t c o s t a l t y b t t h g u e r y
 a d t a c h e v s u c c e s s t h d l y e d s u t u r e t h e r u l s
 e c c e d e d h o u l d h a v s t r i c t c o m p l i n c e O n e
 f a c t t h a t h o p p l a y i s t h a t t h r i s k f c l o s i g
 f r a c t u r h s b e n e a g g r a t d n t h e p a s t P
 d e l t h l e b y d f r a c t e v d s m a y b
 c l s d a f l s l y a s h o u s d s A d t h e y s h l d
 b e c l d a f l e s s l y f o t h e n e d i s g e a t e r s p s i s
 s t a b l h e d n b u a l l y c o m e s t o s t a y

The s t a d d t r e a t m e n t o f w n d s f b o t h f l l
 n d b e f c a d h a d c e p t d t h l t a l n
 t h e t e f v s a t w a g e p e r a t C t n
 u l s m u s t b o b e y e d i f a h g h m s u r o f s u c c e s s
 i s t o b e c h i e d n d d a s t e s a r t b e v o d e d The
 r e l t f t h a t o s t a g e p e r a t n i n 3 4 3 5 w o u d o
 t r e a t d d a r g S e p t e m b e r n d O c t o b e r r e c d
 d t t h e r w t h t h r e l t s n a o d s t r a t l
 b y l a t e c l o s u (s e c n d a r y s u t)

Penicillin as a local bacteriostatic has been evaluated in the treatment of infected wounds. The results of the treatment of 100 wounds with penicillin are compared with the results of the treatment of 100 wounds with penicillin and streptomycin. The results of the treatment of 100 wounds with penicillin are compared with the results of the treatment of 100 wounds with penicillin and streptomycin. The results of the treatment of 100 wounds with penicillin are compared with the results of the treatment of 100 wounds with penicillin and streptomycin.

C n e J M Ea ly and L t T m nt IG n
l t W und of th Jaw In F nch B tt)
Ca ualt s in N rth Africa and Italy J O l
S g 945 3

The t atm nt fgun hot ounds fthej wsm y
be divid d to three d tict pe od the first o
ea lyal p se fbl d l sh ck pai a phy and
m ntl d p ss n s th co d or pr co truct
phase whe m m b l to of th bo fr ments
and c ntrol of inf et n are of pr m y mp ta
and the th d co truct y h s p p e

In the first o rily phas the co t l f h mo
hage th l ef fire pr at y obstruction a d th
t eatme t f sh l by transu o s e t land
lif v measu s Primary ut of th w nd
is not dvied deb d ment although spa ng
should a mat th emov l of d atalized t loose
b o f agm t d f gn b dies Imm bulzat o
f the remai n f agm t sh k lb done by impl
m n s such as t u res l a t s

At th s e d staged finit mea of imm biliz
ng the bo e froug d t (spl t rch nd h nd)
re u d froug d inf ctio ntr lld bvd ga
tio pres ed ss gs nd b t : tates Wh n
the wound ele p k and d oid of em lat
pr mary sut should b d ne Oth r p blem
h ch may equ att t nat th tm d r
r May e t a on of t ths the in f f ct r
Th s should be do e wh ne t oth sd p d f
ts blood supply d bef re co : f the pulpl ads
t unourator

the acute action of the indicated only for large hema

3 Lat primary ut of o d r comm nut
ed fractur Thus may p t s q e trat n of
th s denud d fragm nts

External fixation of the b f gm nts This is occasionally d cat d t mm bl d nt lo bo f gme ts

5 Th f ant os s i This is h lpful
t chn q f r m m bliz gf t es f th m d b
lar ngl when th e m led d pl c me t f the
p t edent l fragme t

I th th d r con tract pha pr pe ea ly
t eatm nt m y s tly s mpl fy the r tructi
s reical proc dur t to c ft tis s a d b ne

The reconstruction of the fossil must be planned first. Pathological conditions of the lower ribs can be related to the local effects of the large disease. The requirements for the design of the frame and distance by means of pedicled flap.

The construction of bone by means of bone grafts requires the presence of well vascularized cartilage of soft tissue. All of the soft tissue is absent and complete immobilization of the graft must be assured. Bone grafts may be taken from the internal aspect of the tibia and may be secured in form of chip, small fragments, or a cancellous solid to the defect. A cancellous block of chip is usually embedded in place. Occasionally a bone strut is used by bone chips. The average time for the solidification of bone grafts is about 12 months.

Th f i s t p a r o s t u c t n e s t s , s t o r
n t h e c a l s u l u s t o f m a n l v e l r d e h c h
a l l p r m t t h e w r g f a p o s t h s A n n a y
g a f t w r p p e d s u n d m l d a d h e l d i p l e w i t h
a s p i n t s s e d T h e s p l t s u l l y t t a c h d t h e
t h b u t n e d e n t u l c a s t m a y b e a h o d
w i t h t l e s s t c l w r p s s e d t o u b l l a y e r s a d
t d v e r g u z

The author's presentation based on series of 63 small scale studies with regard to the use of photographs in the classroom. The author's research was supported by the National Science Foundation.

Ayl tr S O d Al p A F S rg ry a d A
th si f Abdomln I W W u d B i M J
945 547

The art l r p o ts tho f catm nt a d anesthesia
f a s e r s f m i s l u d of th abd m n s e n n
th forw d e a d u r n the p n t camp s
Eur p Appr tely one fourth of th w o k f
th f a d s u r g e o l k e l y to b e c e r n e d w th
th t y p f n j u r y W th the e p t n f r e l
th o s e w h c h w r e o p e r t d n w e g v e p t t h a l
a t h e s l S t e s m a d e n t h g a t e d
o f a h u g d e n e s t h t t o a c c o m p y f r w d
s u r g n s T h e d s s a n d t t m n t o f g u n h t
w o d s o f t h b d m e r d i s e d

Th am nt of t nsl o eq d to r d a
pat t fit f r o p r t o n m st v r y a c d i g t the
s v r t y of th l cal s w ll as th ssoc ated injury
It the a m t m p v e th blood p e s to m
mum f 6 m m d st l d o o m m y stol

Pe t h l d i m w a s c h s n a t h e s l e a n e s t h t e
t h c a u t w s b l d n t h b e g n i n t o t h e
b e s t b u t b c a u s e t a t h n l y d r o g a l b l d
f i l d c o d t n E t h r s c o d d h a r m f u l t o
t s u f f r i g f m a m i d u e t h m h a g
n d h o c k p n l n g c d e r e d d a g s
e c r e l y h k d p l c h c l g w
t m o s m n l s p n t l t i o n f i p e t o t h a l
s s e d d l t c r y t a l l t h d o r r e d
t h e d y o l d s l t w f o d s e f f i c a c a s
t h o e e n t l y p p d A t m a t o f t h c o
t d n o f t h p t t w a b d e h e s s o t h e l t l c
t h l o d p s s u e W h a n t w s b l 7 m m f m

ery a moderate degree of shock a consid-
erent I such patients an induction dose of 1
0.1 to 0.25 gm of pentothal was adequate

Respiratory depression occurred those patients
with spinal shock who received more than 0.5 gm
of an induction dose

Hiccups occurred in cases that required large
doses of pentothal

When pentothal is used as needed more
phenobarbital was administered in a small amount
as it was found that with established shock of
any severity there was very slow absorption from
any other route

Postoperative complications were few and in-
cluded in case of vomiting case of pulmonary atele-
ctasis and 3 cases of pneumonia. Of deaths in
this series of 200 consecutive battle casualties in
which the abdomen was explored in 56 cases only 6
could be attributed to the anesthesia

With this form of anesthesia a no great improve-
ment in the ultimate recovery after perforating
wounds of the abdomen could be achieved but at
least the mortality was no greater than in other
forms

The operative procedure adopted for peritonitis
discussed in detail. It is the opinion of the
author that pentothal has been found to be an ideal
anesthetic for abdominal surgery in shocked pa-
tients. While this drug can be used with safety
when the shock is mild degree of shock and when
large doses have to be given it is difficult to control
the depth of anesthesia in these cases

MARY KARP M.D.

Cooley W. T. P. N. Y. A. L. P. Thrombosis G. Elk
J. J. and Othman C. L. trid. Infections in Wa-
shington D. C. 1945 48-49

Clostridial infection of wounds in human subjects
is essentially a time problem. The local spread
of the infection to the surrounding tissues can be adequately studied
by following the local infection for controlled ex-
periments. The local infection can be studied by the nature
of the local infection system reaction can be investi-
gated by examining the effects of the infection on the
destruction of the local infection

From series of 68 wounds of men from the
World War I found a group of 76 cases with systemic
infections have been studied. All but 4 of these group
had evidence of clostridial infection in their
wounds. The group has been subdivided into the ha-
zardous very fatal systemic action and the fur-
ther fatal cases. The fatal cases of the severe and
8 of the moderate group have a histopathologic
picture of clostridial myositis

Possibly significant features in the blood me-
chanism of blood hemolysis in the high un-
der the microscope. Acidosis did not appear to be greater
than the other would be. While the
hemolysis of the blood is due to the hemolysis
of the red blood cells in the hemolysis
of the red blood cells in the hemolysis

current in a number of cases but this is not specific
for clostridial infection nor can it be attributed to
the direct action of clostridial toxin

At autopsy the fatal cases extensive fat embo-
lism of the lungs and other organs was demonstrated
and demyelination was found in the central nervous
system

It is clear that the systemic reaction in the re-
ported series of 76 cases cannot be attributed to the
effect of clostridial toxin. These results however al-
most certainly a major factor in the 2 fatal cases ad-
mittedly possible that they played some part in the
systemic reaction in the severe cases and in mod-
erate cases which the histopathologic picture
as one of clostridial myositis. In the remaining
cases it is most likely that the part played by the clostridial
infection in the production of the systemic reaction was
negligible. The blood findings suggest that the
products of tissue breakdown may be more im-
portant factor in the systemic reaction than circula-
tion

Such a concept of the nature of the systemic re-
action to clostridial infection could lend support to
the view that adequate surgical removal of necrotic
muscle from the wound is the most vital measure in
treatment of the systemic reaction. The lack of dra-
matic effect with antitoxin would be expected if
breakdown products are largely responsible for the
systemic reaction but antitoxin given early and
large doses might have some protective effect since
it prevents the breakdown of tissues by clostridial
toxins in vitro. It is clearly impossible to attempt
any assessment of the value of chemotherapy
in these conditions from this small group of cases but
it is probable that its efficacy will be limited in
the absence of adequate surgery

JOSEPH K. NARAT M.D.

Boland F. A. Clifton T. S. and Parker F. P.
Trench Foot S. G. 1945 75-84

The authors present an analysis of the observations
on 15 cases of trench foot submitted to their
care during the Italian campaign. Among these
cases were 2 immigrants and 13 the clinical course
of which could not be distinguished from that of
trench foot

The predisposing factors are those of continuous
exposure to wet and cold usually with a dependent
position of the feet and circulatory stasis. Wet socks
and previous attacks of frostbite were also consid-
ered to be etiological factors

Painful and swollen feet were usually the earliest
symptoms the swelling of the appearance before the
pain. Numbness and burning were other symptoms
and weakness and stiffness appeared late. In 5 per-
cent of the patients the pulsation in the dorsal
pedal and the posterior tibial arteries was absent

Skin biopsies taken from patients without gangrene
but with persistent symptoms revealed an increased
formation of collagen. This was most marked in the
papillary layer of the dermis and in the surrounding
subcutaneous tissue

Fr m obs rvat n f th group l pat nt t ap
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cation f the d i d l s ld in foot ca a d th
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B JAM GOLDM M D

Bentley F H and Thomson S Cont l f Inlec
t l n l n R ent W und B i M J 945 47

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Al Embol m D r n g Blood Tra l i
L i L d 945 45 53

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poc l e J F k r c MD

OPERATIVE SURGERY AND TECHNIQUE POSTOPERATIVE TREATMENT

Cl k A M Miln G R d T dd J P Fl a
t n f Skl Grafts w th Hum n Pl m nd
Th mbln La / L d 945 48 498

A method of fi ton f k graft th h ma
plasma d thromb n is d cr b l t is s m l
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whe th pl ma; appl d Th ra sur f e f th
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p e appl d

O 6 bu h e be s cc f lly sk n grafted
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Y g F H m g no C t f f G Graft S z
945 7 6 6

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n ach i tanc l he e grafts v cr then r m c l
f m a j a r of d g s at inter l n th s av
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m ths one y e and ne and one half years

On rem al th tran pl nt e f r mly attached
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xam ned micro cally The author believes that
if the p ese ce f n rmal cart lag n us chitecture
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that th c transplants rem n v l e

The uthor conclud that from ths p eiment
t app ars that co tal cart lage can be tran j a t l
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a d h l f ve LOU T B AR MD

D mm nd R T y l G L nd Edwa d
J T R f m m n izati n t the Rh Fa t
B t f f J 945 584

Th auth rs p o t case f so m mu izati on to
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The mp r t nee of pre rvi g p e tra f io bl od
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th case as al o th nece ty of a e tai n the
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St HEN A ZEMAN MD

M e F M Hep in in th Abdom n A
Sw g 94 58

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F ntz V K N W M thod f flem t i s e
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J EN J M O E MD

D In glann f Ea fy nd L t Post perati Am
huf t n A C mparati Study f 363 Ca
Ar h S g 945 5 4

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pendectomy only (2) patient having a surgical operation on the lower portion of the abdomen with or without appendectomy or without uterine vaginal repair and (3) patients having a cholecystectomy. The age distributions in the 3 groups and number of patients in each age decade are similar. The conclusion of the author notes that early ambulation does not increase the frequency of complications nor does it increase the danger of peritonitis. However, the author states that the danger of peritonitis has been proved by case reports and experience. He never mentions early ambulation eliminates all of the complications. He has claimed by many advocates of this method of postoperative treatment.

H RBE F TH TON M D

Davis H H and Hansen T M In litigation f
th C u c and P e ention f Gas Pain f flow
f eAbd minal Op ration S e y 945 7 49

Pst per tly after abdominal surgery there is
defint dec ea e in intestinal m t l t y D gs such
p tes phyostgm and postgmine h h
stiml t h mall intest n have a pposit fl t
o the c f P tressin inhib ts small bo el actv ty
but tm l t the colon Th acc mulated g s n
th nt t e; ca s d by the wallowing of a
esp cially dur g the indct on pha e f an the
rath r than any put fact p oect Th autho
m asu d th amount of sw ll d at d ng th
i d c t n pha e of anesht e; d fo nd it to y
f m 600 to 2 50 cc

Swallowing and the attendant discomfort of gas pains can be prevented by the preplacement of the L.V. vent to be attached to the W. g. t. n. uction. Once the pass is in the small intestine, the flatulence is easily expelled.

As a self-report action technique, the percentage of patients who dropped out of the program at the end of the 4-month follow-up was 15%. The percentage of patients who dropped out of the program at the end of the 4-month follow-up was 15%. The percentage of patients who dropped out of the program at the end of the 4-month follow-up was 15%.

Pl m i t D B Th M h n l m d M n g
m nt f S gical Shock J A W t 945
7 8

S g cal sh k s the t m comm nly used to de
n t th c te embarrasment failu of tl c u
lat wh h ar es s a lt f bodily inj ry
wheth r p d ced i t nti nally comb t nd in
s g cal pe tions o te t n lly c d nt
of l l f

Th h s bee a g cat d l of d bate ab t th
me ha m f pod ton f bock a d ah t th
r lat c le of ous f rs whch may help
b g g t b t b t c t a s i t h s b e n
tash d pr m l y by ge th t th
wh lm gly mport n a se f su g cal sh k n
m n g od g neral c i t n pr to j r y o
pe t th l call of wh l blood or pl sma
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a e damaged a d body funct on is impa red on the
v hole and a cont n action of such a stat r ults in
complete failure of the ecul t on and death

The loss of whole blood is by far the greatest import-
ance since it is the main cause of shock in op-
erations and in most injuries, high on the blood
vessels. The loss may be to the outside or to the
body cavities or into the tissues. Plasma may be
lost both to the outside and to the tissues in burn

t the t ucs only after the p olon ed se if the
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 t o of exper:n tal shock or limbs crushed and
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 accidents fcu lfe

The cause is a mounting body of clinical evidence that the overall highly important cause of hemorrhage produced by operation and by injury is the local loss of fluid from the circulation and that the fundamental mechanism is the damage to the endothelium of the blood vessel system and the activity of the nervous system are factors of primary importance.

The refutable evidence in support of this view is furnished by the almost complete contraindication of shock, as exemplified by operations and injuries when prompt care is rendered in hospitals in which the operative technique is excellent and blood plasma is given on a generous basis in amounts equivalent to and either somewhat less or with a sufficient replacement of blood plasma loss.

A full appreciation of these facts will lessen the fear of revascularization factors and lead to a greater acceptance in the frequency of transfusions given in amounts equivalent to the blood and plasma loss. This should correspondingly improve the results of surgical therapy.

J H E KIRKPATRICK, M.D.

M L hlin J A Th Intra no Us ofN oc ln
a S b titut f Morphln in Po t peratl
G C d M A J 945 5 383

N ocam h s be a l m nistered int a ven u ly in
the t e m e n t f t n t u m and for th p u r
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k i d y t h a t n o t w e l v h o u s

Pharmacologically, procaine has a marked affinity for erythrocytes and causes convulsant effects in the infant of the cerebrum. Systemic reactions to procaine can be predicted by means of a intradermal wheal of procaine. Toxic reactions involving the intravenous administration of the drug may be either of the convulsant type in the central nervous system which can be controlled by sedation, or of the respiratory-circulatory type controlled by adrenaline.

In the authors series of postoperative cases involving a general anesthesia with the use of morphine by the subcutaneous method and the use of the latter drug the amount of oxygen was given in the form of a luteo. There were no deaths.

B G P SHAT MD

ANTISEPTIC SURGERY TREATMENT OF WOUNDS AND INFECTIONS

Peters L W P phylaxi I Wo nd Infection Studi with P rticul R f nc t S P nd Irrig ti n t h S g 945 5 77

Because the method of prevention of infection and the rate of infection is of great importance in the treatment of wounds and infections, the author has studied the effect of various antiseptics on the wound. The results show that the use of antiseptics in the treatment of wounds and infections is of great importance. The author has studied the effect of various antiseptics on the wound. The results show that the use of antiseptics in the treatment of wounds and infections is of great importance.

The following are the results of the study: 1. The effect of soap and water is of great importance. 2. The effect of scrubbing is of great importance. 3. The effect of soap and water is of great importance. 4. The effect of scrubbing is of great importance.

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The best results are obtained by the use of the following antiseptics: 1. The use of soap and water. 2. The use of scrubbing. 3. The use of soap and water. 4. The use of scrubbing.

STEPHEN A ZIM MD

Hggil J F Wanoek G B R a d N i R W Nut i i off in S f late i i fected W nd In l ing B n E i V J 945 437

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STEPHEN A ZIM MD

n t p e t S gery i perm bl nl h n r
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Another type f b l st n j ry that pr l c l by
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m cha i m i m lar t that p d c e l i bl t
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ation f the bo el The sign ol hyd a l r abdom
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all of th e p t i n t s ec ver without perat n a d
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M y K M D

SURGICAL INSTRUMENTS AND APPARATUS

R h n Land F W and R p e M W Adj tabl
Ca ts in th T tment f J Int Def rm ties
J B S t 945 3

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c h a n g d h c h p r m t t l f r t h r e l a x t f t h
j n t f t h p a s t t o a d o h l v c a s b a l e d
c s t s h v e b e n m a d e a d j u t b l by the p p a t o
o f h n g s M b t m m t e r a l n d l b o r r e s a d
and compen s t f r v a r i o s n t h a m u t o l
f l x o n d f m t y c b m o e a c c u r e l y c h d
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c a t e m p l v d O n p l h g e s s d e p e t d l y
o n s u c c e s s p a t n t s T h m a n r o f m k g t h
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The m p t t a n c f d l y r f t h j n t s
i t h u t g h t b e g a n n t h t o o s t l
s t s e d A d j u s t b l a t e h y t t h e c h e f l
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E C Ro m s M D

PHYSICOCHEMICAL METHODS IN SURGERY

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n is l l l n i t n s of the Int rv t bral
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R t A 4 Th l mpo tane of Exam i n t i n of th
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Adenoca noma of the lung el t elysf w grow
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n ct e r mldly act pulmonary tub culos s
The p e nce f a par nechymal lesi n n and dual
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investigati n f ca cuoma the gland l r f rm of
which is appar ntly resp nsi e to e rly rad cal
surg ry Jos FR K NAR M D

B br n C F Sorn Roentg n logical Con ldera
t on P t nting t Uppe Extremit y Pain J
4m 3f A s 945 7 883

P m d ability a d ab ormal s nsati n m the
upp r e t mity m y b due t trauma (co t on
spr in fr ctur dislocation) or ac t nfect o
rhe mat c e or b rsts Cl bication in th
reg on of th sup a p n tus tend n may cause un
usually seve e pai and d ability

Patients with negat o should r roentgeno ams
are an e gma t the phy can In such stance
path l gy n the r g o of the cerv cal p ne sh uld
always b con id r d a del nusat d a s d i f e n t al
p s bility A common findi g s th n g of the
terv t bral d s es and g erative h ype t oph c
arthrit c h n g in the ve tebra This s r q c tly
brook d n co s deri g the ca s f sh o l d p

Pa n s caused by pressure on the nerve root the
eg n of the interve tebral foramen Arth it c
hang s on the nteri r body of th erieb a do not
p duce pai

The b st th py for sho l d r pa n s is the conv n
t onal ma s g m nual tracti n a d ma p lati n
D athermy tend t a vate the cond tion R e t
gen th rapy ha p o d ced exc l' at re ults m burst
t s The rel f of symptoms s actually d t the
actio f th x r y n th i f f mmat n and t n
th calc um The results of irr d at on therapy of
patients with ruc l rthrits hav be n f rable
in those ast nees in which a surround n inflamm
t on was p es t The r d t n f edema a d pas
sive o g s t n in the i t rvert bral foram re s
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duces the pa In hye tens ve pat nts d p m
by the blood pre ure is f quently seen th s cau d
by irrad tion f th ca ot d ga gl n

The author us s fr m 75 to 100 ntg s f 70
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6 cm distance) twice we kly at first th once
weekly f r f om s t eight t eatments 4 s to 1
course of th rapy i repeated in from six t ght
we ks Caution should be ob served not t und
t eat o ov treat th s pate ts If a le ion is rad o
res stant then x ray therapy sho ld be d i cont ruel
Irradiati therapy has als been efficac us n the
tr atm t of herpes zoster MA RICE D S CH M D

K s ba h H H and Do lan C P Roe tg
th apy f H m ngl m f th L rnx in l
fants J P d at t L 945 6 374

Hem n i ma of the larynx in infants is a v ry re
co iti n

Th auth rs epo t 2 cases n which r entg a
therapy produced very sat sfactory re ults The
f nts were three mo ths and five and one half mo th
old r pect ely In b th em gency t acheot my
had t be perform d p or t th i t tution fan
t atme t A tum r d f r 200 ntgen g e
n l s s than thre we ks with 200 k y p ved d q at
Th a thors al coll ted o cas f om th t
at re Th a tabula ly p s nted by ons d nng
the m st important f ctors such a s x of the pa
t ent ag o t stand ng symptoms em ons lo
tion of th tumor method of dag os t atment
e d result and s ciated path logical ond tions

The follow ng facts ar establishd

Hema g ma f the laryn n n f nts s cong t l
It occurs m t c mmo ly in the m l s altho gh th
cases f th authors we in f m l s Th symp
tom rde f f q ency a e obstruct ve d pa
ns p ratory str d r hoarse cry c o p y co gh
bl od t ed m c gr s hemorria e a d f e il
the e e p l m n c m p l c t n The e may be
ne r m period of rem s on lu t ch n g s
bl od v l rae of th t mo The m j ty of the
f s ons are located n th ubgl t t go Th
d gnosi i ba donth h t r n d a l r y n g o s e
findi g f d o bl h s bgl t t c m s s I the
pre n of tr d r o e m st r u l ot the po bl
ca uch sa mall g t t r c l m c n g n t al eb
b l the glott s macrogloss l r y n al pap l l ma
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945 09 53

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Fig. Left S ft thick n f th hl m h d w bidat lly m p d
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(April 5 '94.) Right Cl nng f th hl th kn g d f th soft p cty
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T l r MD

MISCELLANEOUS

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The autho m dea m phen i ser e lphy
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4 A l l n m a d f o g a s b o n a f i t s
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R d l 945 88

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ys In ome cases bl q rspec al vie s c lo
req r d a fore example e t c ment for subm ntal

I order to be in the actual dimension of an
implantation from the topographic measurement of
the radial to the center of the field points by the
radius. The authors describe four methods

The geometric method which the idea of the
of magnetic but of making
the film and film to be

The lecture in needle methanol in which the needles
th m lv ct as gaug s An d sho n by one
film to le n a pla a l l t plan f th
ther film w ll g tru m g ficat l t l r
the ec n l film f s length th t film d d l
by ts true l gth

3 The method in which a braiding about
5 cm and meter is fixed to the point known

to be as nearly as possible at the same distance as
the implant from each film

4. The indirect cell method is a growing cell culture as a guide.

The first method is rather inaccurate and the results are seldom used. The second is better. The third method is especially valuable in cases of implantation of disease when the sources are distant and/or of unknown length. The fourth method has most frequent application in regular single plane implantations.

The examples chosen by the authors for the illustration of various clinical situations include (1) single planar needles (2) single planar needles (3) two or more planar needles and (4) cylindrical needles as for example the implantation of a catheter.

The conclusion drawn that the centogenographic total radical implantations has a disadvantage than providing a method of dosage calculation. These may be made at a logarithmic time. The same data indicates the ability to visualize and correct faulty distribution of the implants. If there is crowding of the implants at certain points, some of them may be removed. Conversely, as the whole length of the homogeneity of the irradiation is used. The long term advantage consists in the fact that the permanent record can be obtained of every radical implantation and it is on the basis of established clinical results the faults of a certain technique may be corrected. In the meantime it is possible to formulate new distribution rules if clinically certain types of treatment appear more desirable.

T. L. M. D.

MISCELLANEOUS

DUCTLESS GLANDS

Curt G M and Friedman M B Blood Iodine
Study An Analysis of the Blood Iodine in
Thyroid Disease of the S. 9455

The authors state that the principal objective in this study is to determine the relationship between the clinical and pathological changes in the thyroid gland and the clinical picture of the disease. The authors also state that the study is a retrospective analysis of the clinical and pathological changes in the thyroid gland in patients with Graves' disease.

The determination of blood glucose values by the authors was made first by the dry ash technique and later by the chromium tetroxide method. The blood glucose and specifically its twin bound fraction is an index of the circulating thyroid hormone as demonstrated recently by the functional activity of the thyroid gland. Therefore, a rough blood glucose may prove to be of diagnostic significance but it is difficult to obtain a reliable determination of the basal metabolic rate and also in the differentiation of hyperthyroidism from the simulated conditions in which the basal metabolic rate also is affected. In all of the foregoing, the authors have tried to demonstrate clinically from the foregoing without hypothyroidism in which the basal metabolic rate may be otherwise increased.

Perkin and Cattell state that the amount of od ne
n the blood may be a mo e r l ble cr ite i n than the
l al metabolic rate in th d f i e r i l d i a g n o s i s
b o r d e r l n h y p e t h y d m Perkin and H thal
on l u d e d t t t m a t o s s f t h b l d w a d n e l e l
t a k n a t s t a t e d i n t e r v a l s o f f r a m e a n s w h e r e b y p e
d i s p o s i t i o n t o r c u s n e r r p r s t n e o f c l i n i c a l
h p g t h y o d i s m c a n b e p r d e t d h e k e l o f t h e
b l o o d ; d i n e m a y l e u i a n d i f o d t m i n g
t h e c o r t a m u n t f t h y o d t s s u t o r m e B e
t h a u t h o r s n t e t h t h b l o d i n e p p a r s t o b e
a m o e s p e c i f i c m a u f t h y r i d o e a c t i v i t y t h a n
t h e r u m c h o l e s t r y l t h b l o d i n e n e t e m n a
t n a y p r o e o f a l e f o r p a t i n t s w i t h o n
s t r u m w i t h t o l i n t r a t h o r a c e g o i t e o r t h o t h e
a b e r r a n t t h y d t s u e

The a₂g blood odue le l s found to be significantly el ated in ll forms of tuc gate nd v ations n th d idual bl od odue val s w re lke s found to xced th se f n smal p ons Assoc ted w th the inc ease n the blo d n ther wa n ele ted a e e basal m tabol c r to

In n t o b ups of t e g r c l d n g the
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t p h a n y i g n i f i c a n t d i f f b t c t h e a r g
b l o o d o d n e c e t a t i n s H o s m d f f e
e n c i n t h n a t o r q u t y f i t h h l f r
t i o n t e d b l o d o d n e m h t b y p e t d i n
o p h t h a l m c g i t e a n d s h o l d b f t h r n t
g a t e d . I t a s t d t h a t t h b l o d o d n e m v r s

as high as 1.5 nodules per gram of nephthalmic
soil

On the hand the average blood cell count was not significantly elevated in nontoxic nodular glomerulonephritis and in nontoxic diffuse glomerulonephritis. The percentage of cells with a high nucleated red blood cell count was significantly increased in nontoxic nodular glomerulonephritis but averaged only 7.5% in nontoxic diffuse glomerulonephritis.

The a e ge blo d od n n 99 p tients w th
h yothroid m as n t ignificantly l e th n
th t n norm l p on f om the Gre t Lakes g n
l ho gh the e ge h a l m etabol at was d f
n etly duced The val of the aver g blo
od e may ha e b en i f n ed by p v o s od
med cat n n c rtain st ac of h h e
t e v s n cord The imp ta ce i f a t
t on of the ll od od n e p c ally i such pat nt
s m h zed

Th a g blo d iodi e m g pate t w th r
c noma of th thyr id unl h that of pr u
g ou p of 3 m l s p t e n t s d d t d f r g a f i c a t i
f r o m t h e n o r m a l i n s p i t o f a n l e a t d t
m t a b l e a t Th r e w s n o s i g n i f i c a n t r l t
b t e n t r e b l o o d o d n e l e v l a n d t h e d r a t n o
t h s y m p t o m d u t h c a c n m a o r t f e
g o i t e w h n s u c h a e c r d e d T h l o f d
b l o o d o d n e i n c a r i n m a o f t h e t h y r d i s m
d p n d n t n t h e n a t u r e f t h e t h y r d g l a n d u
w h i h t h e m a l a n t g o t h o c t h a n o n t w
m a l n a n t g r o w t h u c l f

In n n of th thyroid d s o d e r s n e s t g t e d v a
the found v g n f i c a t i o n e r o l a t o n
t w e n t e t h l o f t h b l o d o d n e a n d t h d t
f s y m p t m s o f g o i t r l l o e t h a t o m e a s
s o c i a t i o n m a y t w s n d c a t d b y a g n f i c a
p o s i t i v e m u l t i p l e c o t i n e s i c e n t o f t h b l o
d n e i n r l i n t t h b a l m t b l c r a t e a d t h
d a t o l t r e m p t o n n h y p e t h m o
f g t e m a n n o c n d u l a r g o t e T h r e l t s
s h i p s h t h t h b l o d d i n n e r a e s t h
t h n d e r a e t h o m o m b i n t o n o f t h t h
t w o f t e s

In 3 patients the level of thyroglobulin and the level of iodine in the blood were not significantly different.

MEMBER OF THE THERMODYNAMICS

Vieta H R Myasthenia C is J Am M A
045 17 089

The president attempts to validate the
author's knowledge based on nine years of expe-
rience in which he has seen many things.
At the Massachusetts General Hospital Boston
gave a summary of the investigations undertaken
there he found a very few things in tempo-
rary Aspatutpatnt clinic west
bed 935 and about 60 cases a year follow-
ing a similar

and the following lemma probably
 o by metaplasia from histiocytes
 The development of carcinoma
 Th at c f the cell la c mp n nt k d d
 s nt op ns—s m of the authors stat d that it
 s of a carcinomatous and thers th t t as fa
 s r om t sch a tr STEFTE A ZIFM V MD

L pply T C C ts d Cy t Tum rs f th
 Medi tinum 4 h P th Ch 945 39 53

Th gr at a ety f med stin l cv t nd cvst c
 t mors m y b l s f d c g tal (8 types) and
 a qu ed (3 types) Th f llo ng class hcati i
 f r d

Cong ntl () p l m d y t () dermo d
 cv t (3) te atoma (4) pe icard i el m c yst (5)
 b ch al cy t (6) es ph ge lcy t (7) g st nter c
 cv t nd (8) cyst el mpha ma

Acqu d () pa as tic cv t ca ed by the
 tacti h c cu (2) plast cyst due t de
 g n rat n l l d tum and (3) yst ch m
 tom esult g f om d g e at on la hemat ma

A r view of th lt t e l al rge n mber
 in th cong ntl gr p Addtio l d mod b n
 ch l nd gast cysts f th m d a t n m a e
 po t d by the autho W th thes th e e
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 and t tomas 35 b nch l cysts 4 gast cv t
 nd at the most g te se cy ts f th med at m
 El en nd fow tenths p c f the l d m d
 l m d nd t at na e e ca c ou All ther
 types f c ng nital med tnal cy t e n ca
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 fic t et cause ympt m d ng th first th e
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 p n n th chest dy p a a d h m pty The
 tr tm nt f ch e c mplet g c l c n f
 po bl p r t the d l p m t f pres e
 s mpt ms r inf ct J K N MD

Sch pers G W H Th P th logy f Regl n l
 H iris Am J D g t D 94 97

A x ry ten e a tle s p sent d h ch th
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 r po t nd g os path logical n tom g s p th
 ol gy m c p th logy p thelum t ca pr p
 ubmu os m cul t d nt t a es d
 me nt v l m pho l t u a d lymph tes blood
 es l r t e vtol gy m cr g n m
 ani d n b d co—t th ghly l cu d

The t lgy r man co jlet m v ry Th
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 h pes ost r

Reg n l l e t s h a p m y pha chr t r ized
 by st g oled ma N t th st ge f plasma c ll
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 A crit cal ly s uggests th t the p m ry t g
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 ne rop th c d t r b n

RICH D J BE N T J MD

EXPERIMENTAL SURGERY

M Hlg n R M S m Endocrin logical Con lder
 ati n l C l n N pl stic D sea i h
 P th Ch 945 39 6

The hist l g cal t dy of a umb f can
 n plas ms ob ed t ut psy and in g cal
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 can e c lgy na attempt to a mbl pe t u t
 f c t f f r m a b f f f tur nvest h t thus
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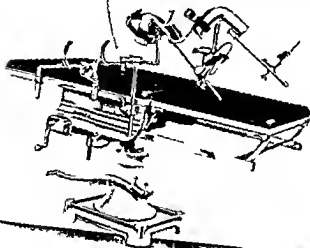
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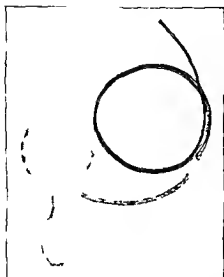
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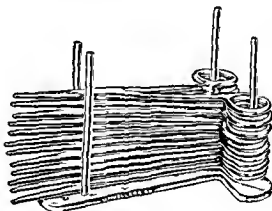
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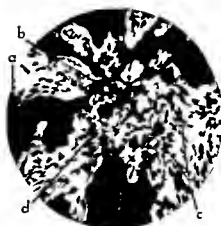
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SURGERY

GYNECOLOGY AND OBSTETRICS

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NUM 5

OSTEOID OSTEOMA

With Case Reports

J F HAMILTON M D F A C P Memphis Tenn e

OSTEOID osteoma is a benign bone lesion so named by Jaffe (2) in 1935. He believes it to be a definite entity and defined it as follows:

The lesion is a benign osteogenic tumor of slow growth. The original phase of its evolution in a given site seems to be the proliferation of the local bone forming mesenchyme and particularly of its osteoblasts. Indeed at an early stage the tumor may consist largely of a vascular mesenchymal substratum closely packed with osteoblasts although showing also a scattering of osteoclasts. He (3) made a further contribution to the subject in 1936. In a later study of this condition in 33 patients by Jaffe and Lichtenstein (4) they saw no reason for changing Jaffe's original conception of the lesion.

Since the available literature on this subject is small it is felt that a further discussion of the disease with a report of an additional 5 patients would be in order. Furthermore it is believed that the condition is more prevalent and widespread than the literature indicates.

As stated it was in 1935 that Jaffe described in detail for the first time this benign bone lesion and reported 5 cases. All of these patients had come to his attention in the year

1933. Because of the similarity in symptomatology physical and roentgenographic findings and the pathologic pattern he gave the lesion the name osteoid osteoma.

In this same article Jaffe refers to a paper entitled Sclerosing Osteomyelitis of Carpal Scaphoid 1909 by Hitzrot with roentgenograms similar to his Cases 1 and 3 but with indefinite microscopic data. Again he refers to 2 case reports by Bergstrand 1930 under the heading of a peculiar and probably not hitherto described osteoblastic disease in long bones of hands and feet. Jaffe feels that these were probably osteoid osteomas. By 1940 Jaffe and Lichtenstein had studied material from 33 patients with osteoid osteoma. Kleinberg (5) reported a case of osteoid osteoma in 1941. Five more cases were reported by him (6) in 1943. Mallory reported 1 case in 1941. Horwitz reported 1 case in 1944. Thoma referred to the condition in 1938 and Lewis recently reported 11 cases in 1 of which there was no microscopic confirmation which we hold to be imperative before a final diagnosis is made. With our 5 cases a total of 58 patients with osteoid osteoma have been studied.

ETIOLOGY

The etiology of the disease is unknown. Whether trauma is a factor in precipitating the condition has not been confirmed.

CLINICAL DATA

Age The lesion is most commonly seen in the second and third decades of life however it has been reported in both younger and older individual. Our youngest patient was 16 (Case 5) the oldest 40 years of age (Case 4).

Sex In the 33 patients studied by Jaffe and Lichtenstein there were 24 males and 9 females. In our series of 5 cases there are 4 males and 1 female.

Symptomatology Pain is the dominant presenting complaint in all patients. Its intensity varies being relatively mild to intense and even preventing sleep in some patients. It may be intermittent in the early stages gradually becoming more constant until it finally forces the patient to seek medical advice. The pain has usually been present for 3 or more months when the patient is first seen by his physician. The pain is most often localized to a very small area frequently not over 1 centimeter in diameter directly over the site of the pathology occasionally it is referred (Cases 1, 4 and 5). The pain and tenderness may antedate any other clinical or even roentgenographic evidence of the disease by several weeks or even months. The fact that the patient has local pain with few physical findings to support it and even negative roentgenograms in some cases is one of the most striking features of the disease.

Physical findings Exquisite finger point tenderness over a small area rarely more than centimeter in diameter is an almost constant finding. This one finding should immediately arouse suspicion in an astute observer that he may be dealing with a bone lesion of the variety osteoid osteoma. The degree to which this physical sign is noted will of course vary according to whether the lesion is near to or more remotely placed from the surface of the body.

Swelling of the adjacent overlying soft tissue is present occasionally. This is due to congestion and edema of the adjacent periosteum (Cases 2 and 3). Local fever is very rare and redness of the skin is seldom noted. Occasionally the patient will complain of a knot at the site of the lesion which is due to a deposit of sclerotic reactive new bone beneath the periosteum. This is especially prone

to occur if the lesion is in the shaft cortex of a long bone and may easily obscure the real pathology unless overexposed roentgenograms are taken at different angles to bring out the nidus as suggested by Pomeranz and quoted by Jaffe and Lichtenstein. Whether the patient will have a lump or dysfunction of a joint depends of course upon the location of the lesion.

Two of our patients (Cases 3 and 4) gave a history of direct trauma 7 months and 24 months respectively before admission to the Clinic.

Skeletal sites Osteoid osteomas have been found in the following bones namely tibia, fibula, femur, vertebra, humerus, ulna, skull, facial bone, phalanges (manual and pedal), patella, calcaneus, talus, tarsal, navicular and ilium. The bones involved in our 5 cases were as follows: second cervical vertebra (1), humerus (1), tibia (2) and talus (1).

Roentgenographic findings The x-ray film of the affected region will almost always reveal a bone lesion responsible for the symptoms and signs presented by the patient. Occasionally the first picture may be negative or the lesion may be so minute that it cannot be seen even after as long as 3 months from the onset of pain as in the case of 1 of our patients (Case 1). Therefore the age and location of the lesion will determine to some degree its roentgenographic characteristics. A typical picture of an osteoid osteoma (Case 3) reveals an oval to round area from a few millimeters to 1 or 2 centimeters in its greatest diameter the center of which presents small areas of rarefaction and condensation. Surrounding this is a narrow zone of condensation and in turn just outside of this is a zone of rarefaction. The surrounding parent bone is as a rule sclerosed for a variable depth. Varying degrees of this roentgenographic description will be noted for example (a) our Case 2 presented no bone defect in the first x-ray picture but weeks later a very small nidus showed up in the external condyle of the humerus; example (b) in our Case 4 a small lesion incorporated in a very dense thickened sclerosed tibia was obscured by the thick sclerotic bone. This may be easily overlooked in a routine roentgenogram. In the latter

case one may have to make several overexposed films at different angles before the lesion which may not be over 3 or 4 millimeters in size can be seen.

Osteoid osteoma may occur in the cortex just beneath the periosteum (Case 1) intracortically (Case 4) or in spongy bone (Case 2). Evidence thus far supports the theory that a much greater defensive response to the lesion is made in the form of marked thickening and condensation of the cortex subperiosteally and intramedullarily if the lesion is situated intracortically in the shaft of a long bone than if it is located in cancellous bone. The reason for this perhaps may be due to the presence of larger stores of calcium and the factors essential to its regmentation being more potent in cortical bone than in spongy bone. However this is purely theoretical and based on conjecture. We have no evidence that this benign bone lesion has ever invaded or broken through the periosteum but if incompletely removed surgically it will continue to grow and produce pain as it did before operation. Osteoid osteoma has never been known to metastasize.

Laboratory findings. All laboratory tests in our cases including Wassermann blood counts, urinalyses and bacteriologic cultures were nonrevealing as to the nature of the lesions. Cultures were made in all of our patients (Cases 1 and 3).

PATHOLOGY

If the pathologic lesion is near or on the surface of cortical bone the periosteum will likely be thickened, edematous and show capillary engorgement (Case 1). The involved portion of the cortex will also be hemorrhagic in appearance. If on the other hand the nidus is within the dense shaft cortex one may find much sclerotic new bone having been laid down beneath the periosteum as well as on the medullary side of the bone. The gross appearance of a typical osteoid osteoma usually consists of blood stained, gritty, friable cancellous like bone. The cut surface shows reddish brown flecks mixed with pearl gray osteoid. The reddish brown flecks represent the calcified osteoid quite similar to callus and the pearl gray the osteoid.

Microscopically a typical picture of an osteoid osteoma (Case 3) consists of much vascular richly cellular embryonal type of osteogenic connective tissue representing all elements necessary in the development of membranous bone from the most primitive myxomatous connective tissue cell to fibrous connective tissue cell and finally to the osteoblast in which are islands and trabeculae of osteoid, calcified osteoid and atypical ossified bone surrounded by large numbers of osteoblasts and not a few osteoclasts. At most any place in the vascular cellular stroma one may see osteoblasts and an occasional osteoclast. Osteoclasts if adjacent to calcifying osteoid or atypical bone usually lie in little depressions called Howship's bays.

The foregoing is a description of the center of the lesion but as the periphery is approached there is more of the osteoid and calcified osteoid which is responsible for the sclerotic outer zone seen in the roentgenogram. Just outside of this zone and separating it from the more or less sclerotic parent bone the primitive vascular mesenchymal type of connective tissue predominates with its ramifications extending into and filling the already enlarged adjacent interstices of the perifocal sclerosed bone. This tissue may reveal osteoblasts but no osteoid or calcified osteoid and is believed to be the precursor to the formation of the pathologic lesion.

DIAGNOSIS

The diagnosis is relatively easily made provided the pathologic process has developed to the point where there is roentgenographic evidence to support the clinical findings and the physician is aware of the possibility of the presence of an osteoid osteoma and has been schooled in the symptomatology, physical findings and roentgenographic evidence produced by the pathologic process. In summarizing the following are the important features which are of aid in making the diagnosis:

1. Pain of a dull aching character most annoying at night.

2. Is localized for the most part to a small area but which may be referred (Cases 1, 4 and 5).

3 Tenderness directly over the site of the lesion and usually confined to a small area 1 or 2 centimeters in diameter

4 Soft tissue swelling may or may not be present (Cases 2 and 3)

5 Bony tumefaction especially if the lesion is in the shaft cortex of a long bone (Case 4)

6 Local fever and redness are very rare

7 No noteworthy systemic symptoms have been observed

8 All routine laboratory tests including culture of the lesion are negative

9 The majority of the patients are in the second or third decades of life when first seen

It one is not experienced in the symptoms and physical finding produced by this disease and especially the roentgenographic features he may easily overlook the lesion. Furthermore he will be prone to misinterpret it as one of an inflammatory nature. This has been a common error committed by those unacquainted with the disease. Of all the diagnostic criteria the sharply localized pain and the roentgenographic picture which appears to be pathognomonic in many cases are the most important.

Differential diagnosis. Osteoid osteoma must be differentiated from (1) sclerosing non-suppurative osteomyelitis of Garre (2) Brodie's intracortical bone abscess (3) osteogenic sarcoma and (4) Ewing endothelial myeloma.

An osteoid osteoma of the shaft cortex of a long bone such as the tibia has been wrongly diagnosed as sclerosing non-suppurative osteomyelitis. One of our cases (Case 4 Fig. 10) is a typical example of this error by both the clinician and the pathologist. It was only through a critical examination of the greatly thickened surgically removed cortical slab of bone by serial X-ray film with different exposure intensities by Colonel D. L. Lomer of the Army School of Roentgenology of Memphis that the small nidus representing the osteoid osteoma was found. A preparation was then made which revealed microscopically osteoid osteoma. The microscopic section was poor due to marked desiccation as a result of the specimen having remained out of fixative solution for a long time.

Microscopically osteoid osteoma may be differentiated from osteomyelitis of Garre and Brodie's abscess because of the absence of an inflammatory cellular reaction and by the presence of the typical tumor tissue.

There is little to support misinterpretation of osteoid osteoma as an osteoblastic osteogenic sarcoma but to one unfamiliar with it microscopic picture consisting of much embryonal osteogenetic connective tissue marked osteoblasts osteoid calcified osteoid and atypical osseous tissue there is some ground for such an error. Roentgenographic findings usually render valuable aid in avoiding such an error. The only reason for mentioning Ewing's tumor is because of the similarity in the early sclerosis produced by both pathologic processes as revealed roentgenographically especially when Ewing's tumor appears beneath the periosteum of the shaft cortex of a long bone. Of course the microscopic evidence is decisive.

PROGNOSIS

The prognosis is uniformly good provided all of the lesion is excised. On the contrary if it is not removed completely pain will continue or recur as the case may be. The prognosis therefore depends upon accurate diagnosis and localization of the lesion and complete extirpation of it.

TREATMENT

Surgical excision of the pathologic lesion is the treatment of choice provided the area is accessible to surgery. Moreover it is the only treatment which has hitherto been tried and described in the literature. So far as is known no other treatment such as deep roentgen therapy has ever been tried. As the latter seems to have little or no effect upon the primitive malignant mesenchyme of osteogenic sarcoma one may assume that it would have little if any effect on osteoid osteoma which microscopically at least is not far removed from osteogenic sarcoma.

CASE REPORTS

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 f r m t o f th t r a l l p l a c d l e o n Th d g n
 b v the uth then s e a c t i e n b n but th
 l a n o c l a s s f i c i a s a n s t i d t e o m a
 Th m m e l a t p t p t i v c r s u e v n t
 f l Th p in p i e n d b e f o o p a t i n s b s d d
 d h e w a l l e l t e u m e k a s g r c e r y
 clerk 5 weeks ft op tio H as next seen o
 October 3 94 2 3 e r s a f t e r p e a t o n f l l o n g
 b d c h g f o m the A r m y b e c e f u r e n c e f
 p n n d o r e a b o u t the o i d l e a f t d i l l i n g
 l t r o u e r e E m t a t t h i m
 e a l d l i g h t t i n e s o the o l d s r i t h
 l i g h t r g h n g f t h t i b a l u f c e T h e r e r
 n s t i c s p t O h l a t s t M r h 16 194
 t h e r g e r a l e l c h i n g a n d l i g h t l l i n g i n
 t h e r g h t l g b o t h l d n d a c h g d n t h
 l g T h u c a m o f t h e s n h f t f h a l f a n
 h u r O t h e r e t h p h y i c l a m a t n d
 t g g r p h c t i m s (Fg 4) e n g t e S m
 d b t a o s e a t t h e d g e o f p n t h p a t e n t h a d
 a n l t s e E x p l t o f t h l e g v t h u g h t
 n j t h e d a t t h a t t i m e W h a b e e n n a b l t
 l t a l a t r f o l l u p n t h c a e
 C A S E G R N 54744 w h i t e m a l e g d 34
 y a r s f r s t i n t h C l n n m b 8
 94 w t h p i n n d e n t h r i g h t l b f 3
 m o n t h d r t i o n E c i s u c h a p l y g t e n
 g g r a t d t h e s y m p t m H a a a k n e d b t h



F 5 l ft C N 54744 At p t t
g or m N mb 8 94 f ght lb w d g
F 6 C se N 4744 Ant pot n oe t o
g m M h 9 94 ks ft fl Fg
d l m ll l d th d d t
d d by f d th t l dyl
f th h ru d t d by

p nat night c n lly Th r h db n ell
ng d d no d fi t h t f r
E m t on f the elbo al d a small f
h g p t q i te tend s d bl nd

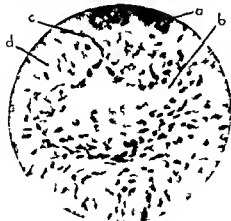


Fig 7 Case N 4744 Ph t m gr ph X35%
eal l bed teo d d t d b ur ded by
l f t blasts d th llul ost g nect
ts d

p lplab l flness er th cvt l c l l f th
humeru b tve the ep c dyle nd l ca o f x
es Th ell gh d th con t y fs ft
w th slght fl t ton n lo al f Range f m
t i c b or m l b t n tem f m t
p n asp c p t t d at th t oft d Roe t
g nogram f th h t lb s gat (Fg 5)
Phy cal therapy t the lb f p blet a
m t eo fect th t l m s f t n
ou c c l d H n t
Mar h 9 104 (4 m th lat) th th m
v mpt m and ph c l f d ng th 6 t
am ton

R cutg n g m (Fg 6) mad t th t m r
led mall l a f l ton l d
Ev f d z mea g 6 b y m l m t r s th
te nal dyl of the h m us 8 m l m t r p
m l t th r cul s fa

Th p f f c as pl ed Ap l 4 94
da by 3 c e t met r of th t male l l
r m d Th surg n ugg st d i e p bl t
of t o d t e m at th t m e p to

C l th c e t f the sm th d t p t
th n r t la d c c l l u t o n by 3 c t m t
ns th e m l l f t d a k ed i d d c l
d Th m e p e s e t led

a c l h g h v e l l a t r u t h h t h
ch t d d c l e f d teo d fo m g k l f
l a t t e k (Fg f t p c e) Ther n m

r st b l t h d th t b cul f o r t e d
d c a l f i d t d a s l l the c l l f t
t s O t l e k c m m Th l l

l a s f t c m p o d f m b y l p
o s t p f t g e t c b t e t
n h h n m o s t b l a t f a f

t o c l t A f lymph c y t e s a d p l a m l l
r s e a th f t t l o A s n p r a c t c a l l a l l
f t h c a th c l l a o c t e t s e m d t

s e p r t e f the most p t h m n t r l l
l e t e d t d d c a l c d d s t d m a t l f m
th d n g p e t b

Th p t t p t p e t c o u r s a s t f l
Th p d a p p d b t t h e r l g h t l l g
d s l g h t l m a t o f m t th e l b h h

w s l s t b t 30 d y f t p r a t
CASE 3 F M N 6358 h t f m a l g d 4
y e a d m t t d t th c l July 943

ith p f l l l g h t k l c D e m b
94 h n p c f f h d s t k h r t h
t e l f f the k l Sh e p n c d m l e d

p d l l m m d t l y h c h h d g d l l y
a d t th t m e Sh h d t t p p d l l g
l t h g h t m h l l t h m p n a d

e l l g h h a d th f t a n d a k l e
O m n a t th a f d m k d e l l g
n d p t t d m f t h a k l a d f t M k d

t d e s l l o th k l b u t e s p c a l l th
t f c Th l c a l f b u t th
k n r t h n k l a d M t th k l n f

3 t s f t h f o o t w a l m t e d b m k d p
A l a t l n t g g a m f t h k l (Fg 8)
l e d p e c u l l l n the p r p o r



F 8



Fig 8b



Fig 8

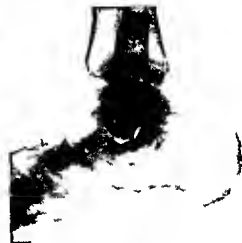


Fig 8d

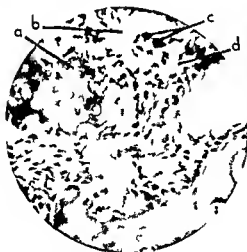


Fig 9

Fig 8 C 3 N 635 Lt l oc tg g m
Jly 943 fnght kl h p l l

t n fth k fth t l ith but n th do f t
pot d g b ethes f c fth b e ltm d d
9by9mlmtrs Th t d t t d
t p ph y m cl tc (5 mllmtrs
th k) J t t de fth cl tc n a
fd hl S c the l n not c g d

oby9mll trs th sp p t fth n k fth
t l Ab t /3 f t p trud b th t Th
t m d l t whl th m g l t d th
t m ded by a th f ad l y b
Lt l oc tg gram 8 m th l t Al ch 3 944 t
ght kl h th l t h g nt e 4 by 4
mllm t S g l spe m th mll m f p
foe l bo h g ry g d or f t n sty f xp
oe tg g ph lly d P t pe t h b tg gram
Ap l 4 944 h th d t h b m d
l f g 6 d th k fth t l
F 9 C 3 N 638 Ph t m og ph (X300)
how l f d ost d b osteod t ocl t d sc l
ost typ t t t

an t do to ma th p t t a ftt d th
kl rset and h sall d to t rn hom f
3 ek On h t n 3 we k lat A gu t
943 thr was less ll g but t dern was
tll p nt the a tr pa t of th tal Sh
as lllng on the foot Sh n t s n



Fig. 3 Ca 4 N 6 666 Ph t g ph (4 X)
b t d t m d m l r m f m p t s c l t
b b Th h t p th l g d t a l l t d t d h y d
t t g f th l t d p p f th d

L m r f th A m S h l f R t g l g)
N ayed th pec m ith diff e t d g ce f e
pos a r y m l l r e f i d t a a s n (Fig)
b A l a g d o w m a d n t h t b a o n \ c m
b f 943 Th l y n g p s t u m a f d t
b d m t o a n d t h c k n d b e e t h h h
m c h h d c l t b e
f t h e l b a t r y t h e d u a s l o o k d n t h
g s d e c p t h c h c o n s t d f a g a t l y t h c k
d h d l a b f c t i c a l b m g 44 m l l
m t r s l o n g b y m l l m e t r s l b y 5 m l l m t
t h c k t l a s t t h e \ r a y f i l m f t h p e c m h d
e a l e d t h f i d s p t A e c t m d e
t h g h t s d f c t h c h l e i t e r a c t t o
p p t t h d g o s o f t d o t e m a (F g 12)
e n t h g h t t h d b c m e d c c a t d b f
t h b l o k w t k e

Reco y a e e n t f l o p e r a t i r e l d t h
p n i m m d t l y H a l t s e e J 7 944

CASE 5 J T S No 6 586 h t m a l g d o
y c a m t t h C l n n M a r h 6 944 t h
p i n t h i c a l p n d e f e r r d p t t h l f t
s h o l l f a b u t y e a r d t u n l h g l
u l l y i n d i r i t y T h e r a s h t y f
n j r y H h a d b t o l d h h a d a f a t n j

a l e a t h e r l l f 8 m t h t h t b n t
E m n a t n e a l d t h h d b e g h l d t l t d

t t h l f t w t h l b l m c l p m a d t
d e s s j t t t h l f t f t h e p p c c a l p u

p c d b t n h b l t h t p f t h
m t l N c k m t a l m d t b t p

c t f m a l l d t d t p t h
h l d n e g t

R n t g m f t h r v l p e (F g 4)
l l n b y 8 m l l m t d m

t f t h l f t p e d c l d d j n t p t f t h
d c r v c a l t b a T h e c e n t f t h l e u

Fig. 3 Ca 4 N 6 666 R t g g m l b ry
944 h d f t t f g l t h k d t

a s m p e d f r a r f i e d a l l t e a s h i c h
t u r n e s o u n d d b y a e f i d h l t h a
f y m a r g a n T h e a d j c t p t o n f t h s p o
p a s c l t i c

T h p t t w r f e l t o e u g e n f
b p s y f r p o s i b l o t o g r m T h
b p s y w p e f m e d n M a c h 9 944



F Case 4 N 6666 Ph t m g ph (4 X)
h t d t m d m l l i m p t s c t c
b b Th h t p t h l g d t l l t d t d h y d
t t g f t h l t d p p e f t h d

L m r f t h A m v S h l f R t g l g v
N a y e d t h s p e c m n i t h d f f e t d g e s f e
p v m l l r e f e d a a s e n (F g 1)
A l g d o m a d n t h t b o n \ v e m
b 4 043 Th l y n g p e s t m a s f d t
b e d m t o a n d t h c k d b t h h h
m h h d c l t b e

In t h e l b o r a t r v t h n d a s e l o k d n t h
g o s d e c p t h c h e t l f a g e a t l y t h c k
d h d s l a b f e t i c a l b n m n g 44 m l l
m e t r s l o g b m l l m e t s d b y 5 m l l m t
t h c k t l a f t t h e \ r a y f i l m f t h s p e c m n h d
t h a l t h h l s p t A e c t n m t e
t h u g h t h d f e t w h c h l e d t e r a c t n t o
p p t t h d g o s o f t d o t e o m a (F g 12)
e t h g h t t u h d b c m e d e s c a t d b e f o r
t h b l o k w t a k

R e c r y a s n t f l p e a t r e l d t h
p a n i m m d t l H e l t s e e J n 7 044

CASE 5 J T S N 6586 h t m a l g d 9
y r s c a m t o t h C l n n M a r h 6 044 t h
p i n t h i c l p n d e f r r d p a n t t h l e f t
h i l f a b u t y e r d t n l a n h g d
u l l n l i t y T h e r a s n h t y f
n y \ H h a l b t i d h h a l a f r a t a d
o a l a t h e r l l f 8 m t h s t h t b n t
E m t a l i t h e l b g h l d t l t d
t t h l f t t h n s l b l m c l e p m a d t n
d e s j t t t h l f t f t h e p p e c a l p u s
p c a l a b o t n h b l t h e t p f t h
m t d \ c k m t a l m t d t b o t 5 p
c t o f m a l i l l d t l t p t h
g f t h e s c d r v a l t b a T h l f t
h l j n e g t

R n t g m f t h r v l p e (F g 4)
l d l l n b y 8 m l l m t d m
t f t h l f t p e d c l e d d j t p a t s f t h
d c r v c l t b a T h c e t f t h l e t

Fig. 3 Case 4 N 6666 R t g g m l b r y
944 h d f t t f g l t h k d t

a c m p e d f a r t h d a l s l o t a s h c h
t u r n e s u d e d b y a e f i d h l i t h a
f y m a g T h e a d j c t p o r t n f t h e s p s
p e s a d t i c
T h p t t r e f e r r d t o n e u r g e f
h p y f r a p o s s i b l o t o g c r m T h
b p y w p e f m e d n M a c h 9 044



Fig. 2. Cas. 4 N. 6666 Pb. t. m. g. ph. (4 X)
 h. t. d. t. d. m. l. l. i. m. p. t. s. c. l.
 b. o. b. Th. h. a. t. p. t. h. l. g. d. t. l. l. t. d. t. d. h. y. d.
 t. a. c. t. g. f. t. h. l. t. d. p. l. f. t. h. d.

Lo. m. r. f. t. h. A. m. y. S. h. l. I. Roentg. l. g.
 N. a. y. e. d. t. h. s. p. c. m. t. h. d. f. f. e. n. t. d. g. I.
 p. o. s. u. a. y. m. l. l. e. f. d. e. (F.)
 A. l. a. g. d. o. m. a. d. n. t. h. t. b. o. n. o. e. m.
 b. 4. 9. 4. 3. Th. r. l. y. n. g. p. e. t. m. a. s. l. n. l. t.
 b. d. m. t. o. a. n. d. t. h. c. k. d. b. t. h. h. h. a.
 m. h. h. d. c. l. r. t. b.

In the l. b. r. a. t. r. y. t. h. J. s. l. k. d. n. t. h.
 g. o. s. s. l. e. c. p. t. h. e. c. n. a. t. e. d. I. a. g. c. a. t. h. t. h. c. k.
 d. h. d. l. a. b. f. t. c. l. b. n. e. m. s. u. n. g. 4. 4. m. l. l.
 m. t. r. s. l. o. b. m. l. l. m. e. t. s. d. b. 5. m. l. l. m. t. r. s.
 t. h. c. k. t. l. a. f. t. t. h. X. r. a. y. f. i. l. m. f. t. h. p. e. c. m. h. d.
 a. l. e. l. t. h. e. h. e. d. s. p. t. A. c. t. m. d.
 t. h. u. g. h. t. d. f. e. t. h. i. c. h. r. l. l. t. e. e. c. t. t. o.
 p. p. o. t. t. h. e. d. a. g. o. s. o. f. t. d. o. s. t. e. m. (F. g. 2).
 e. t. h. g. h. t. t. e. h. a. d. b. e. m. e. d. e. s. i. c. c. a. t. d. b. f. o. r.
 t. h. b. l. o. c. k. t. k.

R. c. o. y. a. s. n. t. f. l. p. a. t. n. e. l. d. t. h.
 p. n. m. m. d. t. l. y. H. e. l. t. s. e. e. J. n. 7. 0. 4. 4.
 C. A. S. E. 5. J. T. S. N. 6. 8. 6. h. t. m. a. l. g. l. o.
 y. r. s. c. a. m. t. o. t. h. C. l. n. n. M. a. r. c. h. 6. 0. 4. 4. t. h.
 p. i. n. t. h. i. c. a. l. p. a. d. f. r. e. d. p. a. n. t. t. h. l. f. t.
 h. l. d. f. a. b. u. t. v. r. d. t. i. o. n. l. a. n. h. g. d.
 u. l. l. y. c. l. i. v. t. h. n. h. t. y. f.
 J. v. H. h. a. d. b. t. o. l. d. h. h. d. f. r. a. c. t. d.
 o. a. l. t. h. r. l. l. f. 8. m. t. h. t. h. t. b. f. t.
 E. m. t. e. l. d. t. h. h. d. b. g. h. l. d. t. t. d.
 t. t. h. l. f. t. w. t. h. d. b. l. e. m. c. l. p. m. a. d. t. n.
 d. e. s. j. s. t. t. t. h. l. f. t. f. t. h. p. p. c. l. p. u.
 p. c. e. s. a. d. b. t. n. h. b. l. t. h. t. p. f. t. h.
 m. t. d. N. e. k. m. t. a. l. m. t. d. t. b. t. p.
 c. t. o. f. m. a. l. l. d. t. d. t. p. t. h.
 r. g. n. f. i. t. h. e. c. d. c. a. l. t. b. a. Th. l. f. t.
 h. l. d. e. g. t.

Roentg. g. m. f. t. h. r. v. c. a. l. p. e. (F. g. 4).
 l. d. a. l. l. n. b. y. 8. m. l. l. m. t. r. s. d. m.
 t. f. t. h. l. f. t. p. d. c. l. e. d. d. y. c. t. p. a. t. f. t. h.
 d. c. r. v. c. a. l. t. e. b. The. n. t. f. t. h. l. i. n.

Fig. 3. Ca. 4 N. 6666 R. t. g. g. m. l. b. ry.
 944 h. d. f. t. t. f. g. l. t. h. u. k. d. t.

c. m. p. e. d. f. r. i. e. d. a. l. l. t. i. c. e. h. c. h.
 t. n. w. e. s. o. u. n. d. e. d. b. a. e. f. i. e. d. h. l. o. t. h. a.
 f. y. m. a. r. g. The. a. d. j. c. t. p. t. n. f. t. h. s. p. o.
 p. a. s. c. l. t. i. c.
 Th. p. t. t. r. f. d. t. o. a. e. u. r. g. e. n. f.
 b. o. p. y. f. p. v. b. l. o. t. g. r. m. Th.
 b. p. v. w. p. e. r. f. o. r. m. e. d. n. M. a. c. h. 9. 944.



F 4 Ca 5 N 6 86 Lt 1 oentg gr m
 Vi h6 944 h pe ub 11 (by 8 mll
 t rs) f the ped l r h f th d c l t b
 Th t s sc l t d p t d f m th p focal
 bo by fied h lo-l k

Our lab ratio rec d nly a pat l th spe
 m n c ns st n of a small p c f s ft f abl
 bl od t i ed t s m s r g b y o by 3 mll
 m t r s th sm ll f m ca t lag f k nodule
 by 2 mll met r s dam t it h d Mic osc p
 call th section t y p c a l f r teo d t om
 th cula o t g n t c connect t su t d
 l f i d o t o d te bla t nd steocla ts (Fig 5
 f o t p e c e)

The p t e n t a d harged t h h m on th 13th
 postope at day While n the h o p t a l he c t n
 ed to e n l g e s c f p a n Th p n h a p r
 st d n c h l f t h h sp i l and ju t e n t l y
 lea ned that th pat t s t r t n for f th
 obs r v a t o n and t e m n t

CONCLUSIONS

A discussion of osteoid osteoma a relatively
 recently recognized disease entity of bone is
 considered to be in order as it is felt that it is
 perhaps frequently overlooked or erroneously
 diagnosed. We have misinterpreted the con-
 dition both clinically and histopathologically.

Its diagnosis in the hand of the inexperienced is most frequently confused with scler-
 osing nonsuppurative osteomyelitis of Garre
 Brodie's bone abscess and osteogenic sarcoma

Diagnosis is relatively easy for one who is
 acquainted with the symptomatology physical
 roentgenographic findings and histopathology.

The frequency of this disease is likely much
 more prevalent than the literature on the sub-
 ject may lead one to believe.

The age of the patient predominantly in
 the second and third decades of life and the
 persistent mild to severe localized pain with
 exquisite finger point tenderness should
 arouse one to suspect the presence of osteoid
 osteoma.

If the nidus has developed sufficiently the
 roentgenographic picture may be almost patho-
 gnomonic of osteoid osteoma. On the con-
 trary the roentgenogram may be negative
 even though symptoms may have been pres-
 ent for months. This type of case should be
 restudied roentgenographically at a later date
 thus giving more time for the lesion to develop.

Physiologic response to the pathologic pro-
 cess varies materially as to whether it is lo-
 cated in spongy bone (Case Figs 5 and 6)
 or in the shaft cortex of a long bone (Case 4
 Fig 13).

The 3 cases of osteoid osteoma herein re-
 ported are presented not with the idea of con-
 tributing anything new to the subject but
 mainly to try to popularize further and to
 spread the information already known re-
 garding the disease. In this way it is hoped
 that the disease may be more readily and cor-
 rectly diagnosed and appropriate curative
 treatment applied when possible which at
 this time purely surgical.

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BACTERIOLOGICAL STUDIES OF CLOSTRIDIUM WELCHII INFECTIONS IN MAN

With Special Reference to the Use of Direct Smears for Rapid Diagnosis

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In the years since Wilsdon's work 1931 on the classification of *Clostridium welchii* much has been published on the toxins of this clostridium but the amount of work dealing with other aspects is comparatively small

The intensive work on *Clostridium welchii* toxins must ultimately prove of great value for the understanding of infections in man and has already provided the basis of tests for the rapid identification of the *Clostridium welchii* (Petrie and Steabben 1943 Hayward 1943 McClean et al 1943) But its very importance has obscured the necessity for the study of other characteristics of the organism

Investigations undertaken in this laboratory in a very large number of abortional infections and recently in a small series of postoperative and posttraumatic cases have shown that the capacity of the *Clostridium welchii* to invade the tissues rapidly is closely correlated with characteristics other than toxigenicity Consideration of morphology cultural characteristics etc has led to a better understanding of certain aspects of *Clostridium welchii* infections and to the development of rapid diagnostic methods

THE DETECTION OF CLOSTRIDIUM WELCHII BY THE DEMONSTRATION OF CAPSULES

Although the *Clostridium welchii* is universally recognized as a capsulated bacterium comparatively little use has been made of this property for rapid identification

Staining for capsules as a means of identification may be applied to smears from cultures and to smears made directly from material suspected of harboring *Clostridium welchii*

In this laboratory we have found Richard Muir's method highly satisfactory The Indian ink method and others which merely demonstrate an unstained halo around the bacilli are not recommended as such methods do not indicate variation in the structure of the capsule

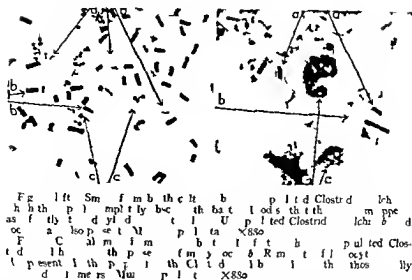
Whether or not strains of *Clostridium welchii* appear capsulated in culture depends very largely on the nature of the medium In Wright's broth containing minced veal less than 40 per cent of the *Clostridium welchii* strains isolated from the vagina are well capsulated but if a small amount of serum or blood is present in the medium approximately 90 per cent of the strains are sufficiently heavily capsulated to be provisionally identified In our experience broths made from liver and those containing liver extract or bile are less satisfactory for demonstrating capsules than is Wright's broth

The presence in the broth culture of other bacteria whether aerobic or anaerobic does not prevent the formation of capsules by *Clostridium welchii* If the strain is distinctly capsulated very small numbers of bacilli can be detected

In this laboratory this method has given very few false positive results Smears of more than 1000 primary broth cultures have shown capsulated bacilli resembling the *Clostridium welchii* and 99 per cent of these cultures were proved to contain this organism Aerobic spore bearing bacilli may occasionally resemble slightly capsulated *Clostridia welchii* but the frequency of formation of long chains by such aerobes the presence of many spores and the usually granular and faint staining of the aerobic bacilli reduce this source of error to negligible proportions

Very occasionally heavily capsulated strains of the *Bacillus coli* may be mistaken for the

F m h D p m t f P t l g y T b W m H p l d
W k e a e d w h g r a m i m t h N i d t h d
Med l Rese ch C cl f A i



Clostridium welchii since in smears made from cultures containing blood or serum capsulated *Bacillus coli* sometimes retain the Gram stain and with Muir's method the capsules of both these bacteria stain similarly.

Theoretically the *Clostridium butyricum* the only other known capsulated clostridium could be another source of error. This is of no moment in abdominal infections but in cultures from wound where contamination with the *Clostridium butyricum* is sometimes common (see MacLennan 1943) this possibility should be borne in mind.

The appearance of the capsulated *Clostridium welchii* produced in broth varies. Usually a deeply stained rod, completely or partially surrounded by less deeply stained capsular material but forms in which the capsule obscures the bacterial rod may also be present. The latter are very faintly stained and appear as pale blue rectangles or cylinders (Fig. 1).

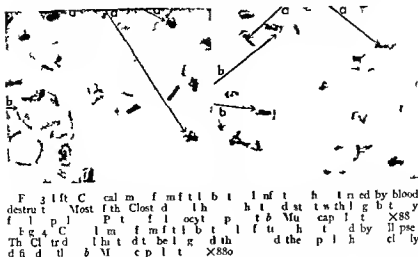
In our experience the demonstration of capsulated rod resembling the *Clostridium welchii* in smears from broth cultures has proved a reliable for rapid diagnosis as the methods which depend on toxin production. In addition it has been found that the former method has the advantage that the medium need not be freshly prepared and when inoculated does not require incubation in the anaerobic jar.

The methods suggested by McClean and associates for detecting in wound exudates the hyaluronidases and other specific exotoxin of the clostridia would be more rapid than cultural method but as yet there is no report of their extensive trial in human infection and they suffer from the disadvantage that they are comparatively complex and call for an experienced technical staff.

The simplest method for the rapid detection of the *Clostridium welchii* is the demonstration of typical capsulated Gram positive rod in smears made direct from the wound or any other site suspected of infection. Not only is it the most rapid method but it calls for the very minimum of equipment and is particularly suited for the routine examination of large numbers of cases in which an attempt is being made to detect the presence of the *Clostridium welchii* before the development of clinically recognizable infection.

Typical capsulated *Clostridia welchii* as seen in direct smear are shown in Figures 2 to 4.

Among the hundred of specimens examined in the last 5 years in this laboratory there was only one instance in which capsulated rod resembling *Clostridia welchii* were reported as present in direct smears when cultures from the same material failed to yield this organism. This discrepancy was probably due to the presence of a heavily capsulated strain of the *Bacillus coli*.



While the use of direct smears is practically never responsible for false positive results it does not detect strains which fail to produce stainable capsules when growing in the tissues or discharges from the infected area but as will be shown in the next section such strains are usually not important in human disease. Some of the strains which are not encapsulated in direct smears produce recognizable capsules when growing in suitable broths.

THE EXAMINATION OF DIRECT SMEARS AS A MEANS OF DETERMINING THE SIGNIFICANCE OF THE PRESENCE OF THE CLOSTRIDIUM WELCHII

In man the mere detection of *Clostridium welchii* in a wound or other potential site of infection is not of great significance. It has long been known that this organism may be present without giving rise to clinically recognizable infection.

Infections following abortion. The chief bacteriological problem in abortifol Clostridium welchii infection is the early diagnosis of the severe generalized infections. It has been apparent throughout the 3 years investigation in this hospital that the recovery of the *Clostridium welchii* be it from the genital tract the urine the peritoneal cavity or the blood does not decide whether a severe infection exists or not. The study of smears from the cervical canal however has provided a solution of this problem (2, 3).

The significance of heavily capsulated Clostridium welchii. An investigation of 40 severe Clostridium welchii infections including 32 in which this infection was the cause of death showed that in every case whether characterized clinically by blood destruction or by colapse heavily or very heavily capsulated bacilli could be demonstrated in smears from the cervical canal. In addition these smears showed evidence of destruction of the leucocytes. Recognition of the damage to the leucocytes was found to be particularly important. While the infection was still early not all the leucocytes were damaged whereas in the late stage of most of the untreated cases nothing but fragments of destroyed cells were seen. In the early stage of a severe infection there were always many leucocytes their absence later was almost certainly due to destruction and not to any failure of the leucocytic response. This is borne out by sections of the uterus from such cases which in the decidua at least always showed abundant leucocytes.

The smears represented in Figures 3 and 4 were from patients with well established severe infections.

In every case in which the symptoms typical of a severe Clostridium welchii infection developed after the patient's admission to hospital and in which investigations were carried out prior to such development the cervical smears suggested a severe infection before it

was possible to arrive at a clinical diagnosis

In more than 150 control cases in which infection with the *Clostridium welchii* was localized to the contents of the uterus or those with *Clostridia welchii* in the blood stream but without the symptoms characteristic of a severe infection due to this organism there was not a single instance in which the smears showed heavily capsulated *Clostridia welchii* as well as damage to the leucocytes. Fourteen patients in this group had smears in which there were many capsulated *Clostridia welchii* but in each instance recovery took place without specific treatment for *Clostridia welchii* even though 4 patients showed one or other of the symptoms usually associated with the severe infections.

When there were only a few capsulated *Clostridia welchii* in the cervical smear their significance was sometimes in doubt since in the early stage of the severe infections the leucocytes usually appeared undamaged when only a small number of the *Clostridium welchii* was present. Reference to the apparent size and structure of the capsules was helpful in assessing such smears. In the severe infections the smears always showed forms with the capsule around the bacillus at least as wide as the rod itself and frequently very heavily capsulated bacilli with the width of the capsule greater than the rod.

In smears from the cases with blood destruction the dimensions of the majority of the capsulated rod were to 3μ in length 1 to 2μ in width and the fragile capsular material at the sides of the rod varied from 1 to 1.5μ . In 3 cases however the *Clostridia welchii* were larger many of the bacilli being 4μ in length and a few longer. In smears from the severe infections characterized by collapse the dimensions were different. Approximately half of the bacilli were found to measure 4μ in length with a width varying from 0.5 to 0.8μ and the width of the capsules ranged from 0.8 to 1.8μ .

In addition to the 2 types of well capsulated *Clostridia welchii* there were forms similar to those already described as occurring in broth cultures (Fig. 1) in which the capsule completely obscured the rod. These obscured

forms varied in length from 1.5 to 4μ and in width from 1 to 2.5μ . Originally all the obscured forms were regarded as heavily capsulated and therefore suggestive of the presence of a strain sufficiently invasive to cause severe infection. But it is now apparent that only those obscured forms not less than 2μ in width and in which the difference between length and breadth is not great cause severe infections. The comparatively long and narrow obscured forms (usually 2 to 4μ by 1 to 1.5μ) are not highly invasive.

Even when these points of differentiation are borne in mind repetition of the smear is often necessary to determine the significance of a few capsulated *Clostridia welchii* in the cervical smear. The number of *Clostridia welchii* to be seen in the smears and the damage to the leucocytes will increase rapidly if the strain is sufficiently invasive to cause a severe infection. In some cases a dramatic change occurs in a few hours in others a period of 12 hours rarely longer may elapse before a smear typical of a severe infection is obtained.

The significance of uncapsulated Clostridium welchii. The presence of uncapsulated *Clostridia welchii* in the cervical smear even in large numbers is of no serious import. Not one instance of a severe *Clostridium welchii* infection was recorded among more than 100 cases with *Clostridia welchii* in the genital tract in which only uncapsulated rods were present in the cervical smears.

The effect of other bacteria. The presence of other bacteria does not interfere with the recognition of the degree of capsulation of *Clostridium welchii* strains. Figure 2 shows typical capsulated *Clostridia welchii* in the presence of many cocci.

Very few of the bacteria other than *Clostridia welchii* which are associated with abortion cause appreciable damage to the leucocytes. Of the aerobic bacteria only the highly virulent strains of the *Streptococcus haemolyticus* Group A cause significant cell destruction and this not often. The presence of such streptococci should not be a serious source of error in the majority of the highly virulent strains of *Streptococcus haemolyticus* Group A can be recognized by their heavy

capsules when a smear is stained with Leishman's stain (5).

Of the anaerobic bacteria other than *Clostridium welchii* only the *Clostridium septicum* was observed to cause damage to the leucocytes and only some strains possess this property. In 4 out of 6 cases harboring both these clostridia a severe infection with *Clostridium welchii* could be excluded because of lack of damage to the leucocytes although in one instance the *Clostridium welchii* were heavily capsulated. In the other 2 cases the smears showed considerable damage to the leucocytes but in one the *Clostridium welchii* although heavily capsulated were more readily phagocytosed than is usual in the severe *Clostridium welchii* infections for this reason the case was regarded as primarily an infection with *Clostridium septicum*. The smears from the remaining case showed in addition to the leucocytic damage the capsulation and resistance to phagocytosis typical of the severe *Clostridium welchii* infections. In this instance the *Clostridium welchii* were considered to be of greater importance than the *Clostridium septicum*.

The reliability of cervical smears for the diagnosis of the severe abortional infections due to *Clostridium welchii* can be gauged by the fact that in this hospital during the last 3 years no patient has been treated for a *Clostridium welchii* infection unless the cervical smear suggested that the infecting strain was highly invasive and during this period no patient who failed to show typical smears died from a *Clostridium welchii* infection.

Correlation of symptoms with certain characteristics of the cervical smear. Not only is there this close correlation between the severity of infection and the appearance of the cervical smear but there are further points of difference in the smears corresponding to the patient's outstanding symptoms. In cases in which gross blood destruction occurred the majority of the *Clostridium welchii* in the smears were short stout rods lying singly or in pairs and the capsules were fragile (Fig. 3).

In cases in which collapse and not blood destruction was outstanding the *Clostridium welchii* were quite different in appearance they were longer thinner and the capsules had a clearly defined outline (Fig. 4).

Further evidence of the association between collapse and the thin type of *Clostridium welchii* was afforded by the observation that in a few of the abortional cases with a mild localized *Clostridium welchii* infection signs of shock developed for which there appeared no cause other than that of the infection. In these instances the *Clostridium welchii* in the cervical smears were long and thin.

These various correlations offer strong support for the view that the nature of the infecting strain is of prime importance in determining the severity and type of infection. The results of cultural studies to be discussed later also support this opinion.

Posttraumatic and postoperative infections. Although direct smears have been examined from only 16 wounds harboring *Clostridium welchii* it is already clear that heavy capsulation, rapid increase in the number of *Clostridium welchii* in serial smears and damage to the leucocytes point to an actively invasive infection. Conversely, poor capsulation, failure of *Clostridium welchii* to increase rapidly, active phagocytosis and lack of leucocytic damage all indicate that a severe invasive infection is unlikely when two or more of these factors are observed they constitute very strong evidence against the diagnosis of *Clostridium welchii* gas gangrene.

In smears from this series of wound infections the criterion of heavy capsulation was the same as that already described for the abortional cases. As with the latter infections obscured forms that were long and narrow were not considered to be sufficiently well capsulated to indicate the presence of an invasive strain.

In 3 cases of rapidly fatal gas gangrene, 2 following minor injuries the smears resembled those of the severe abortional infections. In the other 3 cases of gas gangrene from which smears were examined the amount of leucocytic damage was less than in the fulminating wound infections and in the severe abortional types.

In 3 cases of localized *Clostridium welchii* infection unaccompanied by severe toxemia the smears showed a few heavily capsulated bacilli in 2 and a moderate number of the long thin type in the third but the leucocytes

TABLE 1—SUMMARY OF FINDINGS IN 16 CASES

Case	Chaperon	Findings	6	1	1	1	1
Cl. welchii	Caps. l.	l. m. loc. es	Cl. welchii	loc. l. and	Cl. welchii	loc. l. and	Cl. welchii
1	If. vv.	+					
2	Lo. d. b. d.	—					
3	If. vv.	—					
4	Lo. d. b. d.	—					

were not appreciably damaged. In 3 cases in which the *Clostridium welchii* appeared to be mere contaminants in the wound and were probably only multiplying in dead tissue the capsulated bacilli present were of the long obscured type and were unaccompanied by evidence of leucocytic damage. There were 4 other cases without clinical signs of *Clostridium welchii* infection in which Gram positive bacilli resembling this bacterium were not seen in the direct smears although the *Clostridium welchii* was cultivated from the same material. The findings in these 16 cases are summarized in Table 1.

The presence of heavily capsulated *Clostridia welchii* in a smear taken from those areas of a wound where spread of infection is suspected should probably always be regarded as suggestive of gas gangrene but repetition of the smears may be necessary to determine the leucocytic damage and should always be undertaken when only a small number of *Clostridia welchii* are present.

If the repeated smears show only a few *Clostridia welchii* this is an indication that up to that time a severe infection due to this organism has not developed. Increasing damage to the leucocytes in the absence of an increased number of typical *Clostridia welchii* should be regarded only as indicative of a severe infection with this organism if the smears fail to reveal the presence of other highly pathogenic bacteria. Caution is needed in interpreting an increased number of *Clostridia welchii* in the absence of recognizable damage to the leucocyte. Such a finding might be compatible with the early stages of gas gangrene but is

certainly not typical of a well established severe infection.

MacLennan in his article on anaerobic infections of war wound laid particular stress on the need for differentiation between gas gangrene (*Clostridial myositis*) and the type of *Clostridial* infection which is unaccompanied by severe toxemia (anaerobic cellulitis). The experience of this laboratory suggests that these two conditions when due to *Clostridium welchii* infection could probably be distinguished by reference to the type and extent of capsulation and the state of the leucocyte as revealed in stained smears.

I have not seen an instance of uncapsulated *Clostridia welchii* in the smear from a wound but it appears probable that such strains are unimportant.

THE BEHAVIOR OF THE *CLOSTRIDIUM WELCHII* IN CULTURE AS A GUIDE TO THEIR SIGNIFICANCE

Infections following abortion. Work carried out in this laboratory has shown that culture of the variants of *Clostridia welchii* responsible for the severe infections possess certain characteristics which help to differentiate them from the strains which are relatively harmless. (1) (3) The strains associated with the severe infections have invariably been very heavily capsulated when grown in Wright's broth containing minced veal while nearly 90 per cent of the strains isolated from cases without symptoms of a severe *Clostridium welchii* infection have shown much less capsular material. Indeed more than half of the latter strains have failed to produce any but the smallest amounts of stainable capsular material when grown in the absence of serum. The statement are based on an examination of more than 800 strains.

These results confirm the conclusion drawn from the examination of direct smears that only heavily capsulated strains cause serious infections.

Keppie and Robertson (1944) working with 3/4 hour cultures of *Clostridium welchii* strains grown in a broth containing both serum and glucose and using the India ink method (negative staining) to demonstrate capsulation concluded that a narrow capsule indicated

good toxinogenic ability a wide capsule in most cases poor toxicogenicity. Using this technique they found that strains present in wounds as harmless contaminants showed the widest clear zones around the bacilli.

This finding must not be interpreted as being opposed to the view expressed in this paper that the heavier the capsulation the more likely is the strain to be highly pathogenic. In all work in this laboratory capsulation has been demonstrated by staining the capsules by the method of Richard Muir and not by the negative staining of the India ink method. When these two methods are applied to the same series of cultures the apparent width of capsule around the bacterial rod is not always the same.

In a recent experiment in which smears from young cultures of 9 strains of *Clostridium welchii* were examined by both methods the results were discrepant with 15 of the strains 7 showed medium or wide zones with India ink but only narrow capsules with Muir's stain and in 8 smears the reverse was observed.

Growth characteristics resistance to phagocytosis and to a small extent α toxin production in culture also serve as indications of the significance of a strain of *Clostridium welchii*. The most useful growth characteristics were obtained by using Hüntoon's hormone agar plates (containing rabbit's blood) and serum neopeptone water (50% horse serum). Details of the method and of the results have been published (1, 3).

All but 3 of 40 strains causing the severe infections with blood destruction gave smooth surface colonies nongranular growth in the serum neopeptone water were resistant to phagocytosis in defibrinated human blood and were active producers of α toxin (the other toxin of *Clostridium welchii* were not studied). Five strains associated with infection characterized by collapse were unstable in regard to colony form the predominant type was smooth or intermediate smooth but flattened colonies with ringed edge were also present. These strains produced a granular deposit in serum neopeptone water were resistant to phagocytosis and produced comparatively little α toxin.

The correlation between severity of infection and any one of the above characteristics was not absolute. Of 8 strains which had not given rise to a severe infection 57 (0%) gave smooth surface colonies and a nongranular type of growth in serum neopeptone water thus resembling the strains causing the majority of the severe infections. Similarly 30 per cent of strains not associated with severe infections were resistant to phagocytosis. But only 5 per cent of the strains which had not caused severe infections were very heavily capsulated in broth produced smooth surface colonies and were resistant to phagocytosis.

Certain individual findings however do brand a strain as harmless. A strain which when first isolated produces no capsular material in Wright's broth has not yet been found responsible for a serious uterine infection. Similarly a strain that produces only completely rough flat colonies or one which is very readily phagocytosed when freshly isolated can be ruled out as a cause of uterine infection that is capable of producing clinical signs.

Posttraumatic and postoperative infections. Tests similar to those used for the cultures from the abortion cases were applied to the *Clostridium welchii* isolated from 6 cases of infected wounds.

In 8 instances the patient suffered from gas gangrene due primarily to infection with this organism. In 7 the *Clostridium welchii* was the only clostridium isolated in the remaining one the *Clostridium bifermentans* was also present. Considered as a group the *Clostridium welchii* strains from these 8 cases differed in colony form from the strains causing the severe abortion infections characterized by blood destruction and in α toxin production from the strains causing the rapidly fatal collapse cases.

In smears from cultures the bacilli were stout square-ended and heavily capsulated. On the Hüntoon's plates only 1 strain gave perfectly smooth surface colonies 6 were unstable producing either smooth or intermediate smooth colonies a proportion of which showed flat rough outgrowths the remaining strain produced intermediate smooth colonies only. A nongranular type of growth was pro-

TABLE II — SUMMARY OF FINDINGS IN 26 STRAINS

Cha	ns	cl	f	I	Res	S. asce	3. ase	1. en	3. ase
C	I	S	f	I	pha	d	1. loc	1. d	3. ase
b	h	f	m	I	o- in	Cl	1. h	am	fec
					d b	w	th	ed	de
					d blood	h	se	CL	w
							re	h	lich
							m	loc	di
H	vy	S	I	S	+				
H	vy	U	tl		+	6		3	
		S	I	S					
H	vy	L	ta	I	—				
		S	I	S					
H	vy	I	R		+				
H	vy	I	R		—				
Sl	b	I	S		—				3
Sl	b	I	R		—			3	
S	Smoo	h	I	S	1	media	mo	b	
I	R	=1	rem	di		h	S	B	()

duced in serum neopeptone water some times with a flaky deposit. These strains were resistant to phagocytosis and were with 1 exception active producers of α toxin.

Two out of 3 strains isolated from cases of localized *Clostridium welchii* infection unaccompanied by severe toxemia differed from the strains associated with gas gangrene one by producing intermediate rough surface colonies and a granular type of growth in serum neopeptone water and the other in its susceptibility to phagocytosis.

Of 7 strains which appeared to be mere contaminants of wounds 3 could not be distinguished in culture from those of the gas gangrene cases but in each instance direct smears showed that neither the capsulation nor the leucocytic damage was typical of a severe infection. The other 4 strains were only slightly capsulated in broth and readily phagocytosed. 3 of these strains produced intermediate rough and 1 intermediate smooth surface colonies.

The remaining 8 strains of *Clostridia welchii* in this series were from infected wounds which also showed other clostridia the details of which were not available to me. Three strains resembled those associated with the known cases of gas gangrene due to *Clostridia welchii* but the other 5 were readily phagocytosed and 4 were poorly capsulated. This suggested

that in 5 cases of which were fatal gas gangrene it was anaerobes other than *Clostridia welchii* which were the important infecting agents.

The findings in regard to capsulation in broth culture surface colony form and resistance to phagocytosis of the 26 strains isolated from wounds are summarized in Table II reference to which suggests that these characteristics are a less reliable indication of the significance of the *Clostridium welchii* in a wound than the appearance of the direct smear.

In 1 case in this series gas gangrene was accompanied by jaundice and hemoglobinuria. This was the only instance among the traumatic infections in which both the direct smears and the cultural characteristics of the infecting strain were indistinguishable from those of the severe abortional infections with blood destruction. A further parallel was the recovery of the *Clostridium welchii* from the blood and urine during life.

THE MODE OF DEVELOPMENT OF *CLOSTRIDIUM WELCHII* INFECTIONS

The studies of abortional infections showed that the invasiveness of the infecting strain was of paramount importance in the development of the severe *Clostridium welchii* infections. This finding coupled with the observation that many freshly isolated strains of the *Clostridium welchii* were pathogenic for guinea pigs when a toxin free inoculum was used focused attention on the mode of development of infection in man (4).

In the past our understanding of *Clostridium welchii* infection has been retarded by too much stress being placed on the significance of the exotoxins. It was assumed that the bacilli themselves were not invasive and that therefore their introduction into wound caused serious infection only in the presence of considerable tissue damage of foreign bodies of interference with the blood supply etc.

The occurrence of gas gangrene due to *Clostridia welchii* often of a fulminating type following the hypodermic injection of a bland substance or after any other trivial injury is evidence that with some strains the mere in

roduction of the organisms into the tissues will initiate a serious infection

The recent papers of Robertson and Keppie (1941 and 1944) show that toxin production alone as measured by *in vitro* tests does not satisfactorily explain the behavior of *Clostridia welchii* when present in wounds and in our experience toxin production alone has not provided a satisfactory indication of the severity of the abortional infections

Two other observations support the hypothesis that the *Clostridium welchii* in its attack on human tissues is not dependent only on its power to produce lethal exotoxins. First the study of abortional infections in general reveals certain points of similarity between the fulminating infections with *Streptococcus haemolyticus* Group A and those due to the *Clostridium welchii*. In both the infection becomes rapidly generalized and positive blood cultures are usually obtained in the early stages of the illness. In both there is a correlation between severity of infection and intense capsulation of the infecting strain.

Second the exotoxins of *Clostridia welchii* are weak in comparison with those of some of the other highly pathogenic clostridia and yet gas gangrene due to *Clostridia welchii* usually develops more rapidly than do the infections caused by the other anaerobes. This latter observation is in keeping with the view that the *Clostridium welchii* is a potentially invasive organism because of its possession of a capsule.

In a previous publication I have suggested that a better understanding of *Clostridium welchii* infections is afforded if we regard the strains of this organism as divisible into groups according to the invasiveness of the bacilli themselves. A study of some hundreds of freshly isolated strains of *Clostridia welchii* and a consideration of the lesions which are produced in the patients by these organisms has led me to suggest the following 3 groups (4).

The first and most important group consists of those strains which are so highly invasive that they can attack undamaged tissue. Judging by the experience of this laboratory the majority of such strains produce smooth surface colonies extremely heavily cap-

sulated and are completely resistant to phagocytosis. These highly invasive variants are comparatively rare.

Second there are strains of moderate invasive power. They do not readily invade undamaged tissue but apparently can spread rapidly in damaged areas where they produce sufficient exotoxin to damage adjacent tissue and thus cause a spreading infection. In the absence of extensive tissue damage strains such as these are unlikely to cause serious infection in man. These strains show some but not all of the characteristics of highly invasive variants. They are heavily capsulated although as a group less so than the highly invasive variants and are either completely or moderately resistant to phagocytosis by human leucocytes. As a rule they do not produce typically smooth colonies on Hinton's hormone agar plates after 48 hours incubation.

Third there are strains of low invasive power which apparently multiply only in dead tissue and cannot invade adjacent areas even if these are damaged by toxin so that a spreading infection is never produced by such strains. Usually these strains produce rough colonies are poorly capsulated and readily phagocytosed. Occasionally a strain of low invasiveness possesses one but never several of the characteristics of more virulent organisms.

Work on the invasiveness of the *Clostridium welchii* strains is still in progress and further experience may well modify some of our present opinions but not I think our view of the importance of the invasiveness of the *Clostridium welchii* bacilli and of the practical significance of the degree of capsulation and damage to the leucocytes as revealed in smears from the possibly infected area.

The importance of the invasiveness of the *Clostridium welchii* apart from the exotoxins produced has received scant if any attention from recent writers. MacLennan (1943) in his articles on anaerobic infections of war wounds did not stress this point with the result that some of his views are almost certainly not applicable to infections caused by the *Clostridium welchii* alone.

For example this author's statement that the clostridia are primarily and essentially

saprophytes is too sweeping as long as the *Clostridium welchii* is included in the group. Apart from the experimental evidence I find it impossible to regard the *Clostridium welchii* as essentially a saprophyte in view of first the occurrence of rapidly fatal infections following hypodermic injection and second the occurrence in the presence of severe abdominal infections of invasion of the blood stream in the early stage of the disease usually in the absence of extensive damage to the uterus.

The view that the development of *Clostridium welchii* infection in man is largely dependent on the invasiveness of the bacilli themselves has an important bearing on other points raised by MacLennan. This author pointed out that neither in prevention nor in treatment had much advance been made in the last 25 years in spite of the increase in the potency of antisera. While this statement was made in regard to gas gangrene generally available evidence shows that it is particularly true for *Clostridium welchii* infections. This fact is another argument against the hypothesis that the virulence of the infecting organism is all important. Once it is realized that in the severe types of *Clostridium welchii* infection the invasive power of the bacilli themselves is of considerable importance it is apparent why improvements in antisera have not produced startling results. In earlier work carried out in the laboratory it has been shown experimentally that in vasine is only partially influenced by antitoxin.

Again MacLennan stated that on the practical ground gas gangrene should be eminently preventable by surgical method alone yet such has certainly not been the case. Clearly here is another good reason for discarding the old idea that *Clostridium welchii* bacilli themselves are nonvirulent and therefore cannot invade any but grossly damaged tissue.

APPLICATION TO THERAPY AND RESEARCH

The earlier sections of this paper have described the use of direct smears and to a large extent the use of cultures for the rapid detection of *Clostridium welchii* and as a

means of determining the significance of the organism.

These tests can therefore be used as a guide for treatment. In a case with clinical signs of gas gangrene or other type of clostridial infection smears typical of a severe infection with *Clostridium welchii* will indicate the need for instituting full treatment against the organism whereas if the smear does not suggest a severe infection it focuses attention on the possibility of some other aetiological cause in the patient's symptoms. Thus a more extensive examination of the smear may show clostridia forms resembling *Clostridium septicum* or an infection with anaerobic streptococci or the *Streptococcus haemolyticus* Group A.

Direct smears should play a large part in the management of the case in which the *Clostridium welchii* is detected in a wound but which at that time does not show clinical signs of gas gangrene. In such cases it would be logical to withhold specific treatment as long as the smears did not suggest an actively invasive infection.

Only limited use has so far been made of direct smears. MacLennan (1943) stressed the usefulness of a Gram stained smear in the diagnosis of gas gangrene. But if the *Clostridium welchii* is the infecting organism this is not enough in such case it is essential to use a stain which shows the capsules and does not distort or fail to stain the leucocytes. In the Medical Research Council's War Memorandum on gas gangrene (1941) the importance of the findings in Gram stained smears from wound was discussed in some detail but no mention was made of the demonstration of *Clostridium welchii* capsules to determine either the presence or the significance of the clostridium. Reed and Orr (1941) in their article on the progress of medical science in relation to gas gangrene mentioned the making of Gram stained smears at the same time as attempts at cultivation were undertaken but did not suggest the use of direct smear for the rapid diagnosis of *Clostridium welchii* infections.

Failure to recognize the importance of bacteriological method for the diagnosis of severe *Clostridium welchii* infections is apparent in two recent articles on puerperal infections

In that of Rendle Short (1942) the criteria for the bacteriological diagnosis of the severe *Clostridium welchii* infections were not discussed and in Salma's paper 'The Occurrence and Significance of *Clostridium Welchii* in the Female Genital Tract' (1944) no mention was made of any laboratory method for assessing the significance of the presence of this organism.

To determine the value of any particular form of treatment in serious *Clostridium welchii* infections knowledge of the invasiveness of individual strains is essential. Any claim of success is quite without justification if cases are included in which the *Clostridium welchii* detected lacked the necessary invasiveness.

Knowledge of the invasiveness of individual strains is also important for the evaluation of prophylactic measures. Without such an assessment exaggerated claims may be made since any method will succeed if only harmless strains are present.

Since in the severe *Clostridium welchii* infections the invasiveness of the bacilli themselves is as important as toxin production treatment should be directed against both aspects. There can be little doubt that antitoxin must be employed in all *Clostridium welchii* infections that warrant treatment but in cases in which the smears indicate the presence of a highly invasive strain therapy with an antibacterial agent effective against such variants is also necessary.

In planning experimental work designed to test therapeutic substances full consideration should be given to all the properties of the strain used as the infecting agent. In a previous article (4) I have pointed out that many of the reports dealing with the treatment of experimental *Clostridium welchii* infections with the sulfonamides prove but little since the strains used were not fully described and the time elapsing since their isolation was not given.

This latter point is most important. Work in this laboratory has shown that many freshly isolated strains of *Clostridia welchii* from human sources are pathogenic for guinea pig when washed cultures are used. But this property is fairly rapidly lost with some strains

in less than 3 months. Similarly resistance to phagocytosis by human leucocytes may quickly disappear during artificial cultivation.

Further evidence of the necessity for using freshly isolated strains has been provided by recent experiments in rats carried out in the laboratory. When rats were infected with a freshly isolated strain from a fatal abortional infection the administration of antitoxin alone failed to save more than a small proportion of the animals while treatment with both antitoxin and an antibacterial agent was highly successful. Repetitions of the experiments over several months showed a decrease in the virulence of the strain as evidenced by an increasingly larger proportion of survivors in the group treated with antitoxin alone.

SUMMARY

1 The rapid identification of the *Clostridium welchii* by the demonstration of stained capsules is described. The method has been successfully applied to smears from broth cultures as well as from tissues suspected of harboring this clostridium.

2 Methods for determining the significance of the presence of *Clostridia welchii* in relation to abortifl and posttraumatic infection are discussed. In both types of infection it was found that the degree of capsulation together with the extent of the damage to leucocytes as revealed in direct smears provided a reliable indication of the severity of infection. It is concluded that the examination of smears from the suspected infected area is the most rapid and most reliable means for the bacteriological diagnosis of the severe types of *Clostridium welchii* infection.

3. The development of *Clostridium welchii* infection in man is discussed and it is suggested that the invasiveness of the bacilli themselves apart from toxin production largely conditions the occurrence of clinically recognizable infection.

4 The application of these methods and conclusions to therapy and research is indicated.

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AN EXPERIMENTAL EVALUATION OF AMERICAN COMMERCIAL BIVALENT AND PENTAVALENT GAS GANGRENE ANTITOXINS

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A REVIEW of the history of malignant edema and gaseous gangrene (2) shows that most surgeons who have had experience in the use of gas gangrene antitoxins favor their use but there have been a few who have not been so impressed. One suspects that in some instances those who have condemned the use of serum have failed to distinguish between its prophylactic and therapeutic values that perhaps in some cases the serum has not been used until symptoms were far advanced and then in quantities too small to be of value or under other unfavorable conditions.

This writer believes that gas gangrene serum is not needed at all for wounds which receive prompt adequate surgery that its principal value is prophylactic to prevent or delay anaerobic infection until adequate surgery can be secured that it can never take the place of adequate surgery and that for these reasons it is much more important in relation to war wounds than in relation to civilian wound. But he believes also that it has definite therapeutic values when used in adequate dosage as an adjunct to surgery in the treatment of malignant edema and gaseous gangrene due to anaerobic bacilli.

Early in our study of civilian wounds the writer was asked to make a study of commercial gas gangrene antitoxins. Specimens of these were furnished by seven manufacturers. They came in small rubber capped bottles or syringes each containing one therapeutic dose. The different brands will be designated by the letters A B C D E F and G.

The contents of these containers were in all cases clear or only slightly opalescent liquids and remained so on storage in an electric refrigerator for more than 2 years without any visible evidence of deterioration. All of the tests were made before the dates of expiration printed on the labels.

Serum B the only pentavalent antitoxin had the following stated potency

B cell	perfring	tit m	1000 units
B cell	septicus antitoxin		1000 units
B cell	h t lytic antitoxin		3000 units
Bacilli	vs	tit m	500 t
B cell	d l h	tit m	500 ts

It is to be understood that these are international units but as I have recently shown (3) no two of these standard international units are defined alike in terms of minimal lethal doses of toxin neutralized. Granting that it is possible to define antitoxin units in terms of minimal lethal doses only approximately we find that the approximate protective power in terms of mouse minimum lethal dose of toxins which are represented in this therapeutic dose of antitoxin is as tabulated in the following:

B cell	perfring	tit m	500 000 t 700 000
B cell	septicus	tit m	400 000 t 64 000
B cell	h t lytic	tit m	also t 35 000
B cell	vs	tit m	ab 17 500 000
B cell	d l h	tit m	28 000 t 5 000 000

All of the other serums were bivalent each therapeutic dose containing 10 000 units of *Bacillus perfringens* antitoxin and 10 000 units of *Bacillus septicus* antitoxin.

EXPERIMENTS ON *BACILLUS PERFRINGENS*

Since *Bacillus perfringens* is the commonest single cause of gaseous gangrene experiments were started in the first place with toxin and subsequently living cultures of this microorganism were used.

TABLE I—PROTECTIVE ACTION OF GAS GAN
GRENNE ANTIPOIN AGAINST TOXIN OF BA
CILLUS PERFRINGENS

	D		f t v		d		f t to	
Guz	W h	Dose	Gerum	Dose	Le ns		F l	
me	gr m	f us		se sor			l	
66	s		—	—	Ed m	ly rup	Rec very	
63			—	—	Ed m	l sch	Rec ry	
6			—	—	M k	ded m l sch	Rec ry	
	s	s	—	—	M i	te d m d h scab se la	D i da	
	s		A		\		L d	
			B		\		L ved	
6			C		\		L d	
6			D		\	h tem	L d	
			E		\		L d	
	so		F		\		L ed	
66			G		\		L ed	

TABLE II — PROTECTIVE ACTION OF GAS GIV
GRENE ANTITOXIN AGAINST TOXIN OF B
CILLUS PERFRINGENS

Dose f i c i			dose f a t i n			
ur p m be	W h	Dose f	Serum	Dose f r i m	L	F i res.
5			—	—	Ed m l	De d h
8	55	5	—	—	M k d d m l ru ha bd i ex perf r	Dead do
8	5		—	—	M k d d ly sch	R m
8	5	5	—	—	M k d d ly sch perf	E d do nal
9	5		A		N	L ed
90			B		N	L d
86			C		N	L d
			D		N	L d
85			E		N	L d
			F		N	L ed
			G		N	L d

EXPERIMENTS WITH THE TOXIN OF BACILLUS PERFRINGENS

A toxin prepared by Dr. M. A. Logan of the University of Cincinnati was supplied. It was packed in ice and shipped by airplane July 18, 1941. This toxin was stated to contain about 100 units of alpha toxin per cubic centimeter as determined by Van Heiningen's method *in vivo*. It was said to have been preserved with phenylmercuric acetate and appeared as a clear light golden liquid with a light sediment of crystals resembling those of tyroline. It was sterile. We always stored it in an electric refrigerator kept at degrees C.

July 1942 a guinea pig weighing 603 grams was injected with 1 cubic centimeter of this toxin subcutaneously. This animal developed marked subcutaneous edema with liquefying necrosis over the hit. On the following day the edema was apparently subsiding but the animal was very sick and died about noon. Its belly wall was full of mottles but there was no evidence of penetration of the abdomen. The abdominal viscera appeared to be normal but the lungs were congested.

A smaller guinea pig weighing 45 grams was injected subcutaneously with 1 cubic centimeter of the same toxin boiled 2 minutes. This animal developed overnight marked subcutaneous edema without liquefaction but recovered.

A guinea pig weighing 25 grams inoculated with 1 cubic centimeter of unboiled toxin subcutaneously developed marked edema over the site which became severe at 48 hours. At 72 hours there was liquefying necrosis and at 96 hours the skin ruptured after which an eschar formed. This scar sloughed in 16 days leaving a clean healthy granulating area which eventually healed.

A guinea pig weighing 205 gram given 0.05 cubic centimeter of toxin had a moderate edema and followed a course to recovery similar to that of the preceding animal.

Experiment 1. October 1-4. A series of guinea pigs was injected with freshly made mixtures of 1 cubic centimeter of the toxin and 1 cubic centimeter of the antivenum. Four control animals all but one had a fever that the receiving mixture received graded doses of toxin alone. Table I summarizes data

TABLE III — PROTECTIVE ACTION OF GAS GANGRENE ANTITOXIN AGAINST TOXIN OF BACILLUS PERFRINGENS

Guinea pig	Weight	Dose of antitoxin	Serum	Dose of toxin	Lesions	Final result
1	355	—	—	Edema, lysis, rupture	Death	5 days
2	30	—	—	Mild edema, lysis, rupture	Recovery	3 days
3	35	—	—	Marked edema, death	Recovery	3 days
4	35	5	—	Mild edema, death	Recovery	3 days
5	355	A	—	N	Lesions	4 hours
6	65	B	—	N	Lesions	3 days
7	355	C	—	Mild edema, lysis, rupture	Death	4 hours
8	35	D	—	N	Lesions	3 hours
9	—	F	—	N	Lesions	3 hours
10	—	F	—	Mild edema, lysis, rupture	Recovery	3 hours
11	—	O	—	N	Lesions	3 hours

Table I shows that all of the controls developed the characteristic edema with subcutaneous lysis rupture of the skin in 2 cases recovery in 3 and death after 11 days by secondary infection of an adherent scab in the case of the animal that received the smallest dose of toxin

One of the test animals developed a slight transient edema none of the rest showed any symptoms

Experiment 2 October 23 1942 a series of guinea pigs was injected with mixtures of 1 cubic centimeter of toxin and 0.1 cubic centimeter of each of the antitoxins along with 4 of the heaviest animals as controls receiving graded doses of toxin The data are summarized in Table II

Table II shows that the test dose of 1 cubic centimeter killed a large guinea pig in less than 22 hours while marked lesions were produced with smaller doses down to 0.15 cubic centimeter and 2 of these animals also died later with abdominal perforations

None of the test animals receiving 0.1 cubic centimeter of the various antitoxins showed any effects whatever

TABLE IV — PROTECTIVE ACTION OF GAS GANGRENE ANTITOXIN AGAINST TOXIN OF BACILLUS PERFRINGENS

Guinea pig	Weight	Dose of antitoxin	Serum	Dose of toxin	Lesions	Final result
1	35	—	—	Marked edema, lysis, rupture	Death	5 days
2	35	—	—	Mild edema, lysis, rupture	Recovery	3 days
3	75	—	—	Mild edema, lysis, rupture	Recovery	3 days
4	37	5	—	Mild edema, lysis, rupture	Recovery	3 days
5	55	A	—	Moderate edema, lysis, rupture	Recovery	3 days
6	55	B	—	Edema, lysis, rupture	Recovery	3 days
7	3	C	—	Edema, lysis, rupture	Recovery	3 days
8	—	D	—	Moderate edema, lysis, rupture	Recovery	3 days
9	6	E	—	Edema, lysis, rupture	Recovery	3 days
10	5	F	—	N	Lesions	3 hours
11	—	G	—	Edema, lysis, rupture	Recovery	3 hours

Confirming experiment 1
Experiment 3

Experiment 3 November 4 1942 a series of guinea pigs was injected with mixtures of 1 cubic centimeter of toxin and 0.01 cubic centimeter of each of the antitoxins along with the usual controls The data are summarized in Table III

Table III shows that the test dose of 1 cubic centimeter killed a large normal guinea pig in about 40 hours Guinea pigs receiving smaller doses down to 0.03 cubic centimeter all showed characteristic lesions but recovered

Five of those receiving mixtures of 1 cubic centimeter of toxin and 0.01 cubic centimeter of antitoxin showed no result but in 2 instances this dose of antitoxin failed to protect against the development of the usual lesions 1 of these guinea pigs died on the 5th day but the other one recovered slowly

Experiment 4 November 19 1942 a series of guinea pigs was injected with mixtures of 1 cubic centimeter and 0.001 cubic centimeter of antitoxin except that in the case of antitoxins C and F 0.01 cubic centimeter was used to recheck the results in Experiment 3 The usual controls were used The results are shown in Table IV

EXPERIMENTS WITH LIVING CULTURES OF BACILLUS PERFRINGENS

Experiment 5 January 8 1943 a series of guinea pig was used to test both the prophylactic and therapeutic action of serum B against a virulent culture of *Bacillus perfringens*. The culture selected was my old *Bacillus welchii* No 36 which was isolated in 1918 from a swelled can of commercially canned Swiss chard (4). This culture has been maintained ever since in deep brain medium or deep 1 per cent agar at room temperature and has retained its originally high virulence remarkably well having never failed in all these 5 years to kill overnight guinea pigs with typical lesions in a dose of 1 cubic centimeter or less. It always produces a massive edema on subcutaneous injection followed very soon by extensive spreading lysis emphysema and death within 18 to 4 hours. It belongs to Wilsdon's type A (1).

One cubic centimeter of a 16 hour culture of *Bacillus perfringens* No 15196 (old No 36) in glucose broth in a constricted tube with marble seal (5) was injected into each of 10 guinea pigs during an interval of 1 minute. The heaviest animal received no treatment. It died in exactly 6 hours on autopsy the characteristic emphysema and lysis were seen. A culture from the heart's blood was sterile. The lightest animal received 1 cubic centimeter of serum B simultaneously at 6 hours there was a slight edema which subsided overnight. It survived without any visible effect. The remainder of these guinea pigs were injected subcutaneously at intervals up to 6 hours with 1 cubic centimeter or 4 cubic centimeters of serum B as indicated in the following protocol.

Guinea pig No 150 eight 33 g m d
cubic centimeter of culture subcutaneously
intramuscularly was given. Subcutaneous emphysema and
lysis were present but heart blood was sterile. Animal
died at 6 hours.
Guinea pig No 49 weight 35 g m ed
1 cubic centimeter of serum subcutaneously. At 6
hours there was slight edema which subsided at
day. Lived.
Guinea pig No 56 weight 245 g m At 6 hours
there was slight edema and subcutaneous emphysema
serum was given subcutaneously at 6 hours. Slight
edema at 4 hours subsided. Fluctuation began at
5 hours. Timers at 6 hours. Timers at 6 hours.

was not sick at 48 hours the fluctuating area was
drying up at 72 hours weight was 225 grams and
necrotic eschar was 5 centimeters in diameter at
11 days a dry adherent eschar 3 centimeters in diameter
was present. Lived.

Guinea pig No 148 weight 28 grams At 1 hour
there was slight edema and 4 cubic centimeters
of serum was given subcutaneously at 6 hours
slight edema at 24 hours slight necrosis at 48
hours the edema was drying up at 72 hours the
dry area of necrosis was 1 centimeter across at 11
days no edema was noted. Lived.

Guinea pig No 155 weight 3 grams At 2 hours
there was slight edema and 1 cubic centimeter
of serum was given subcutaneously at 6 hours moderate
edema at 24 hours not ill area of liquefaction
and necrosis measured by 2 centimeters at 48 hours
area of necrosis drying up at 72 hours small dry
area of necrosis by 1 centimeters at 11 days about
the same. Lived.

Guinea pig No 154 weight 35 grams At 2 hours
there was slight edema and 4 cubic centimeters of
serum was given subcutaneously at 6 hours moderate
edema at 24 hours animal was not ill area of
liquefaction and necrosis measured by 3 centimeters
at 48 hours area of necrosis was drying up
at 72 hours dry area of necrosis was 1 centimeter
across at 11 days but the same. Lived.

Guinea pig No 137 weight 35 grams At 3 hours
there was slight edema and 1 cubic centimeter of
serum was given subcutaneously at 6 hours moderate
edema at 4 hours not ill area of necrosis
was 2 by 3 centimeters at 48 hours area of necrosis
drying up at 11 days dry adherent eschar 2 by 3
centimeters. Lived.

Guinea pig No 145 weight 35 grams At 3 hours
there was slight edema and 4 cubic centimeters of serum
was given subcutaneously at 6 hours moderate
edema at 24 hours not ill area of necrosis by 3
centimeters was drying up at 48 hours dry area of
necrosis 2 by 3 centimeters at 11 days dry adherent
eschar 2 by 3 centimeters. Lived.

Guinea pig No 5 weight 335 grams At 6 hours
moderate edema and emphysema were noted. One
cubic centimeter of serum was given subcutaneously
at 24 hours there was present a marked edematous
area 4 by 5 centimeters by 7 centimeters with a small
area of 1 centimeters across. The area was painful
but a malapparently was not sick at 48 hours
about the same. 72 hours two areas of lysis were
noted each 3.5 centimeters across and continued by
sinus fluctuating most and painful at 96 hours
eight 335 gram areas dry at days granulating
2 centimeters by 3 centimeters. Lived.

Guinea pig No 53 weight 365 grams At 6
hours marked edema emphysema and lysis
noted. Four cubic centimeters of serum was given
subcutaneously at 24 hours edema of lysis 4.5 centimeters
by 7 centimeters painful but a malapparently
not sick at 48 hours fluctuating area 3 centimeters
by 5 centimeters by 5 centimeters but
not sick at 72 hours about the same. Lived.

TABLE VI — PROTECTIVE ACTION OF GAS GANGRENE ANTITOXIN AGAINST *BACILLUS SEPTICUS*

Guinea pig number	Dose of culture		Dose of antitoxin		Les.	Final result
	Weight in grams	Dose of antitoxin	Serum	Dose of serum in c.		
76	35		—	—	Typical	Dead 6 hours
77	3			—	Typical	Dead 6 hours
78	5		—	—	N	Lived
75	50	50	—	—	N	Lived
7	8		A		N	Lived
6	50		B		Delayed	Dead 5 days
6	8		C		N	Lived
60	9		D		N	Lived
6	8		E		Typical	Dead 1 hour
6			F		N	Lived
6			G		N	Lived

week post-vital with c. *Bacillus perfringens* to infect heart blood in wet pour cul. *Bacillus septicus*

tion ruptured of skin: 76 hours about the same weight 340 grams at 7 days clean granulating area 4 cent met r s o v e chest wall h a l u g L v e d

It is clear from these data that serum B had not only prophylactic but marked therapeutic action against infection with *Bacillus perfringens* saving the lives of all treated animals in of which treatment was not started until the control animal was already dead

EXPERIMENT ON *BACILLUS SEPTICUS*

In order to utilize the animals surviving Experiments 1 and 2 on *Bacillus perfringens* these were tested for passive immunity to *Bacillus septicus*. The culture used for this experiment was my No. 397A which was received in September 1918 from Dr. J. P. Scott of Kansas State College Manhattan Kansas as Robertson's *Vibrio septique* No. 282 N. I. F. Type. Later Institute 1923

Experiment 6 October 8 1914 a series of guinea pigs was injected subcutaneously with *Bacillus septicus* No. 2397A grown for 24 hours in a 1 per cent glucose meat broth medium in the doses which are indicated in Table VI

The control animals were all fresh and unused prior to this test the test animal had all received freshly made mixtures of 1 cubic centimeter of the indicated antitoxins with 1 cubic centimeter of the toxin of *Bacillus perfringens*... in Experiment 1 a week previously. Six of these had shown no symptoms while seven one guinea pig No. 56 had had a slight transient edema

The results are shown in Table VI

Table VI shows that *Bacillus septicus* killed large guinea pigs in a dose of 0.1 cubic centimeter in about 6 hours while 0.01 cubic centimeter had no apparent effect. Those animals which died showed the postmortem subcutaneous and pulmonary congestion edema and light emphysema so characteristic of animals dying with infection by *Bacillus septicus*. The heart's blood yielded pure cultures of *Bacillus septicus* and the characteristic filaments were demonstrated in every instance upon the surfaces of the livers

Five of the animals injected with 1 cubic centimeter of the different gas gangrene cultures a week previously were still protected completely against a dose of culture ten times as large showing no lesions of any kind and surviving

One animal which had received serum B was apparently well on the 4th day but was found dead on the 5th day with characteristic lesions and a pure culture of *Bacillus septicus* in the heart's blood. Another which had received serum E died along with the control's in about 16 hours with similarly characteristic postmortem findings

Experiment 7 October 30 1914 a similar experiment was made with the guinea pigs used in Experiment 1 as test animals. These had received freshly made mixtures of 0.1 cubic centimeter of the various cultures with 1 cubic centimeter of *Bacillus perfringens* toxin one week previously and had shown no symptoms. All other conditions were the same except that a 48 hour meat broth culture of *Bacillus septicus* 2397A was used. The results are shown in Table VII

Table VII shows that 0.1 cubic centimeter of the test culture of *Bacillus septicus* killed a guinea pig in about 4 hours while 0.01 cubic centimeter had no apparent effect

TABLE VII — PROTECTIVE ACTION OF GAS GANGRENE ANTITOXIN AGAINST BACILLUS SEPTICUS

Dose of culture		Dose of antitoxin		Dose of serum		Lesions	Final result
Guinea pig number	Volume in c.c.	Volume in c.c.	Volume in c.c.	Volume in c.c.	Volume in c.c.		
99	3	—	—	—	—	Typical	Dead in 4 hours
	5	—	—	—	—	Typical	Dead in 4 hours
	5	—	—	—	—	Negative	Lived
	3.5	—	—	A	—	Typical	Dead in 4 hours
90	5	—	—	B	—	Delayed	Dead in 36 hours
86	3.5	—	—	C	—	Negative	Lived
	5	—	—	D	—	Typical	Dead in 4 hours
88	3	—	—	E	—	Typical	Dead in 4 hours
4	3.5	—	—	F	—	Typical	Dead in 4 hours
	5	—	—	G	—	Negative	Lived

TABLE VIII — PROTECTIVE ACTION OF GAS GANGRENE ANTITOXIN AGAINST BACILLUS SEPTICUS

Dose of culture		Dose of antitoxin		Dose of serum		Lesions	Final result
Guinea pig number	Volume in c.c.	Volume in c.c.	Volume in c.c.	Volume in c.c.	Volume in c.c.		
96	5	—	—	—	—	Typical	Dead in 7 hours
5	3.5	—	—	—	—	Typical	Dead in 4 hours
0	0.5	—	—	—	—	Negative	Lived
		—	—	A	—	Typical	Dead in 4 hours
3	5	—	—	B	—	Typical	Dead in 4 hours
		—	—	C	—	Typical	Dead in 7 hours
	0.5	—	—	D	—	Typical	Dead in 4 hours
	3	—	—	E	—	Typical	Dead in 4 hours
81	0.0	—	—	F	—	Typical	Dead in 4 hours

Days previously with blood culture of Bacillus perfringens on 1st animal had eschar on belly no ulcers
 1st animal had eschar on belly no ulcers
 1st animal had eschar on belly no ulcers

Four of the animals that had been protected against *Bacillus perfringens* with 0.1 cubic centimeter of antitoxin died in about the same time as the control which received the same amount i.e. 1 cubic centimeter of culture. 1 died in about 36 hours. All of the animals that died showed the characteristic pathologic changes aforementioned and yielded pure cultures of *Bacillus septicus* in culture from the heart's blood.

Two animals which had been inoculated with serums C and G showed no symptoms and survived.

Experiment 8 November 10 1942 the guinea pigs which had received 0.01 cubic centimeter of the different antitoxic serums along with 1 cubic centimeter of *Bacillus perfringens* toxin 6 days previously were used. One of these animals still had a large but clean eschar. Serum G was not represented the corresponding animal having died in Experiment 3. A 24 hour glucose broth culture of *Bacillus septicus* 2397A grown in a constricted tube (5) was used as the test culture. The results are shown in Table VIII.

Table VIII shows that only one animal in this experiment survived i.e. the control

which received only 0.01 cubic centimeter of culture. The first control and all but one of the test animals were found dead in 17 hours. The second control guinea pig No. 115 and guinea pig No. 118 died in 21 and 0 hours respectively.

All of those that died excepting No. 118 showed the usual pathogenic changes and positive heart's blood cultures. No. 118 was the one which had a large healing eschar resulting from its prior injection with *Bacillus perfringens* toxin. This animal died in 20 hours but showed only a moderate subcutaneous edema and no marked congestion either of the subcutaneous tissues or of the lungs and its heart's blood culture was negative. The observations suggest a possibly adjuvant action.

Experiments 6, 7 and 8 are combined in Table IX.

It would not be fair to compare the summary of experiments on *Bacillus septicus* culture with that on *Bacillus perfringens* toxin owing to the diversity of factors involved such as the use of whole culture instead of toxin and the lapse of a week's time from the injection of the antitoxin before the cultures were injected. Therefore while a

TABLE IX—SUMMARY OF EXPERIMENTS 6 7
AND 8 ON PROTECTIVE ACTION OF GAS CAN
GRENE ANTITOXIN AGAINST BACILLUS SEP
TICUS

Num- ber of guinea pigs	Ave weight grams	Dose in cubic centimeters	Serum	Dose of serum	Lesions	Died	Lived
3			—	—	Typical	—	—
3			—	—	Typical	—	—
90			—	—	N	—	—
33			A		N	—	—
5					Typical	—	—
3					Typical	—	—
30			B		Delayed	—	—
5					Delayed	—	—
3					Typical	—	—
1			C		N	—	—
5					N	—	—
3					Typical	—	—
5			D		N	—	—
					Typical	—	—
6					Typical	—	—
			E		Typical	—	—
3					Typical	—	—
					Typical	—	—
			F		N	—	—
					Typical	—	—
					Typical	—	—
			G		N	—	—
					N	—	—

higher percentage of animals injected with *Bacillus septicus* died in spite of prior injections of antitoxin it is not possible to conclude that these serums had less protective action against *Bacillus septicus* than against *Bacillus perfringens*. The important conclusion seems to be that all but one serum had marked protective action against at least 10 fatal doses of culture when given a week previously in a dose of 1 cubic centimeter and in 2 instances in a dose of 0.1 cubic centimeter. Two serums B and E apparently had slight protective power under these conditions but the next experiment showed that one of these B was by no means devoid of prophylactic value.

One notable difference in the action of *Bacillus septicus* and *Bacillus perfringens* is to be

noted. Guinea pigs frequently survive and recover perfectly after having severe lesions from either the toxin or culture of *Bacillus perfringens* but they rarely do so after an injection of *Bacillus septicus* which produces noticeable lesions. Furthermore guinea pigs inoculated with small doses of *Bacillus septicus* often show no signs of illness at all for a day or so but succumb rapidly once infection that is septicemia really starts. In this respect an infection with *Bacillus septicus* resembles an infection with *Bacillus anthracis*.

Experiment 9 January 9 1943 a series of guinea pigs was used to test the prophylactic and therapeutic value of serum B against *Bacillus septicus*. Upon analyzing the data already collected we later realized that this was really one of the two least favorable samples of antitoxin available for such an experiment. It was intended to extend these tests to all of the other serums but this was impossible because of the limitations of time.

Each of 12 normal guinea pigs was injected subcutaneously in an interval of 13 minutes with 1 cubic centimeter of a glucose broth culture of *Bacillus septicus* 2397A grown for 3 days in a constricted tube with marble seal (5). Three served as untreated controls on dosage 2 of these died in 3 hours 1 in 48 hours all with typical pathology and positive heart's blood cultures. One received 1 cubic centimeter of serum B simultaneously it never showed any symptoms. The others were treated at intervals by subcutaneous injection of 1 or 4 cubic centimeter of serum B as indicated in the following protocol with the results noted.

Guinea pig No. 68 weight 37 grams O cub c
e timer f cult wa gi n subcuta usly
An mal w s d ad 3 h urs

Guinea pig No. 57 weight 35 grams O t th
c b c e timer f ultu e was gi subcuta
ouly 1 mal wa dead n 3 h o rs

Guinea pig No. 5 weight 34 grams O hun
d edth cub c ntmete of c ltu e was gi e subcu
tan u ly At 3 h urs th r was sl ght b tan
ons edema An ml w o t s h It w s d ad 48
hours

G : ea p g No 16 w ight gr ms O c b c
c nt m te f c ltu plus 1 c b c nt m te of
rum B w r gi s b ut cou ly No e dlt
L d

G p g N 66 weight 5 g ms O c b c
t m t f cult w s o j e ubc t eo sly At

hours the edema slight edema 1 cubic centimeter of serum B was given subcutaneously at 25 hours slight edema not seen at 48 hours dry necrotic area 1 centimeter across Lived

Guinea pig No 158 weight 55 grams One cubic centimeter of culture was given subcutaneously At 2 hours slight edema 4 cubic centimeters of serum B was given subcutaneously at 3 hours slight edema not seen at 48 hours dry necrotic area 15 centimeter across Lived

Guinea pig No 159 weight 29 grams One cubic centimeter of culture was given subcutaneously At 4 hours 2 minutes slight edema One cubic centimeter of serum B was given subcutaneously at 23 hours slight edema not seen Animal as dead in 47 hours

Guinea pig No 160 weight 300 grams One cubic centimeter of culture was given subcutaneously At 4 hours 6 minutes slight edema 4 cubic centimeters of serum B was given subcutaneously Animal was dead in 23 hours

Guinea pig No 161 weight 3 grams One cubic centimeter of culture was given subcutaneously At 75 hours moderate edema One cubic centimeter of serum B was given subcutaneously Animal was dead in 3 hours

Guinea pig No 167 weight 3 grams One cubic centimeter of culture was given subcutaneously At 75 hours moderate edema Four cubic centimeters of serum B was given subcutaneously Animal was dead in 23 hours

Guinea pig No 161 weight 320 grams One cubic centimeter of culture was given subcutaneously At 1 hour marked edema 1 cubic centimeter of serum B was given subcutaneously Animal was dead in 3 hours

Guinea pig No 165 weight 33 grams One cubic centimeter of culture was given subcutaneously At 12 hours marked edema 1 cubic centimeter of serum B was given subcutaneously Animal was dead in 3 hours

All animals that died showed the usual pathologic picture on autopsy and all heart blood cultures yielded *Bacillus septicus*

The results showed that serum B had definite prophylactic but little therapeutic value under the conditions imposed Unfortunately it was not possible to repeat this experiment with weaker test doses which the writer believes would have given more favorable results or to test the therapeutic action of the other brand of serum some of which might well have given much better results

EXPERIMENTS ON *BACILLUS NOVI*

For these experiments my *Bacillus novyi* No 15107 (old No 140) was selected This culture was received from Dr Michel Wein

TABLE V.—PROTECTIVE ACTION OF GAS GANGRENE ANTITOXIN B AGAINST *BACILLUS NOVI*

Gmbe	Weight grams	Dose (c.c.)	Dose (c.c.)	Lesion	Final result
7	30		—	Typical	Dead in hours
			—	Typical	Dead in hours
	60		—	Typical	Dead in hours
6	60	00	—	Typical	Recovered
				N	Lived
09				N	Lived
	5			Typical	Dead in hours
	00		00	Typical	Dead in hours

H blood culture
N culture from heart blood

berg of the Pasteur Institute in Paris France in March 1921 as *Bacillus oedematis* No 128 Without entering upon a discussion of the long controversy over the correct name of this organism let us say simply that we regard *Bacillus novyi* as the earliest valid binomial for this species (4)

Owing to the increased number of infections by *Bacillus novyi* encountered during the African campaign (9) the inclusion of antitoxin for *Bacillus novyi* in polyvalent anaerobic gas gangrene serum suddenly became a matter of considerable urgency However serum B was the only one claiming to contain antibodies for this species at the time these experiments were in progress Two experiments were conducted with this serum

Experiment 10 February 25 1943 a series of guinea pigs was injected with *Bacillus novyi* 15107 grown for 3 days in glucose broth in a constricted tube with marble seal (5) Four animals served as controls on dosage while 4 others comprised the test with serum B given simultaneously The results are shown in Table V

Table V shows that 1 cubic centimeter of this culture of *Bacillus novyi* killed small guinea pigs in about 22 hours One hundredth cubic centimeter killed one in about 46 hours with typical pathologic changes but while 0.001 cubic centimeter produced a marked anasarca this gradually subsided without rup

ture of the skin and this animal slowly recovered

On the other hand guinea pigs receiving 1 cubic centimeter and 0.1 cubic centimeter of serum simultaneously with 1 cubic centimeter of culture showed no symptoms at all and lived but those receiving doses of 0.01 cubic centimeter and 0.001 cubic centimeter died about the same time as the controls. Cultures were made from the heart's blood of 4 of the animals that died but all were negative

PROPHYLACTIC AND THERAPEUTIC ACTION OF SERUM AGAINST BACILLUS NOVYI

Experiment 11 March 5 1943 a series of 11 guinea pigs was injected subcutaneously during a period of 35 minutes with *Bacillus novyi* 15197 grown for 48 hours in glucose broth in a constricted tube with marble seal (S)

Three animals served as controls on dosage 2 as prophylactic controls on the serum. The details of treatment with serum B and the results are shown in the following protocol

Control Dosage

Guinea pig No. 4 weight 55 grams subcutaneous culture of culture was given subcutaneously at 24 hours the result was moderate edema. Animal died 7 hours

Guinea pig No. 98 weight 45 grams 0.01 cubic centimeter of culture was given subcutaneously at 4 hours moderate edema was noted. Animal was dead 48 hours

Guinea pig No. 176 weight 43 grams 0.001 cubic centimeter of culture was given subcutaneously at 4, 48 and 72 hours slight edema was noted. Animal recovered

Control Serum

Guinea pig No. 1 weight 2 grams subcutaneous culture of culture plus 0.01 cubic centimeter of serum was given subcutaneously. Result: Lived

Guinea pig No. 91 weight 370 grams subcutaneous culture of culture plus 0.001 cubic centimeter of serum was given subcutaneously. Result: Lived

Test on the Specificity of Serum

Guinea pig No. 186 weight 365 grams subcutaneous culture of culture as given subcutaneously. At 4 hours no symptoms. Subcutaneous culture of serum was given subcutaneously at 4 hours moderate edema at 48 hours edema subsided at 72 hours. Animal took good care at 6 days completely recovered. Lived

Guinea pig No. 94 weight 35 grams 0.1 cubic centimeter of culture was given subcutaneously at 4 hours light edema. Subcutaneous culture of serum was given subcutaneously at 24 hours moderate edema at 48 hours edema subsiding at 66 hours. Edema almost gone at 6 days completely recovered. Lived

Guinea pig No. 19 weight 33 grams 0.01 cubic centimeter of culture as given subcutaneously at 6 hours slight edema. Subcutaneous culture of serum was given subcutaneously at 24 and 48 hours moderate edema at 72 hours and 96 hours subsiding at 12 hours found dead (pneumonia). Died

Guinea pig No. 189 weight 37 grams 0.01 cubic centimeter of culture as given subcutaneously at 8 hours slight edema. Subcutaneous culture of serum was given subcutaneously at 4 hours and 48 hours moderate edema at 72 hours edema subsiding at 96 hours completely recovered. Lived

Guinea pig No. 95 weight 305 grams subcutaneous culture of culture was given subcutaneously at 24 hours moderate edema. Subcutaneous culture of serum was given subcutaneously at 48, 72 hours severe edema. On 96 hours severe edema. Lungs ruptured at 1 day adherent to each other. At 3 centimeters with considerable adhesion. Animal's weight and in position of death at 33 hours. Granulating at 4 days. Each lean 15 centimeters by 3 centimeters (54 days). Completely recovered. Lived

Guinea pig No. 99 weight 300 grams subcutaneous culture of culture was given subcutaneously at 24 hours moderate edema at 27 hours edema. Subcutaneous culture of serum was given subcutaneously at 54 days completely recovered. Lived

All animals that died were examined post mortem. The characteristic moderate to marked subcutaneous edema was observed in each instance. There was some blood tinged effusion but little or no true congestion and no emphysema or lysis. The lungs were pale except in the case of guinea pig No. 190 which showed a moderate congestion of all lobes indicating pneumonia. There were no other gross changes in the viscera. Heart blood cultures were made in each case but all were negative

This experiment showed that gas gangrene serum B had considerable therapeutic action in guinea pigs inoculated with a small but fatal dose of *Bacillus novyi* if used within 4 hours

EXPERIMENTS ON BACILLUS HISTOLYTICUS

Serum B was the only one that claimed to have antibodies for *Bacillus histolyticus*. The culture selected for the following tests was

TABLE VI—PROTECTIVE ACTION OF GAS GANGRENE ANTITOXIN B AGAINST *BACILLUS HISTOLYTICUS*

Guinea pig	Wt. lb.	Dose of serum	Result	Time of death
1	1.5	—	Typical	Death 18 hrs.
2	1.5	—	Typical	Death 18 hrs.
3	1.5	—	Typical	Death 18 hrs.
4	1.5	—	Typical	Death 18 hrs.
5	1.5	—	Typical	Death 18 hrs.
6	1.5	—	Typical	Death 18 hrs.
7	1.5	—	Typical	Death 18 hrs.
8	1.5	—	Typical	Death 18 hrs.
9	1.5	—	Typical	Death 18 hrs.
10	1.5	—	Typical	Death 18 hrs.
11	1.5	—	Typical	Death 18 hrs.
12	1.5	—	Typical	Death 18 hrs.
13	1.5	—	Typical	Death 18 hrs.
14	1.5	—	Typical	Death 18 hrs.
15	1.5	—	Typical	Death 18 hrs.
16	1.5	—	Typical	Death 18 hrs.
17	1.5	—	Typical	Death 18 hrs.
18	1.5	—	Typical	Death 18 hrs.
19	1.5	—	Typical	Death 18 hrs.
20	1.5	—	Typical	Death 18 hrs.
21	1.5	—	Typical	Death 18 hrs.
22	1.5	—	Typical	Death 18 hrs.
23	1.5	—	Typical	Death 18 hrs.
24	1.5	—	Typical	Death 18 hrs.
25	1.5	—	Typical	Death 18 hrs.
26	1.5	—	Typical	Death 18 hrs.
27	1.5	—	Typical	Death 18 hrs.
28	1.5	—	Typical	Death 18 hrs.
29	1.5	—	Typical	Death 18 hrs.
30	1.5	—	Typical	Death 18 hrs.
31	1.5	—	Typical	Death 18 hrs.
32	1.5	—	Typical	Death 18 hrs.
33	1.5	—	Typical	Death 18 hrs.
34	1.5	—	Typical	Death 18 hrs.
35	1.5	—	Typical	Death 18 hrs.
36	1.5	—	Typical	Death 18 hrs.
37	1.5	—	Typical	Death 18 hrs.
38	1.5	—	Typical	Death 18 hrs.
39	1.5	—	Typical	Death 18 hrs.
40	1.5	—	Typical	Death 18 hrs.
41	1.5	—	Typical	Death 18 hrs.
42	1.5	—	Typical	Death 18 hrs.
43	1.5	—	Typical	Death 18 hrs.
44	1.5	—	Typical	Death 18 hrs.
45	1.5	—	Typical	Death 18 hrs.
46	1.5	—	Typical	Death 18 hrs.
47	1.5	—	Typical	Death 18 hrs.
48	1.5	—	Typical	Death 18 hrs.
49	1.5	—	Typical	Death 18 hrs.
50	1.5	—	Typical	Death 18 hrs.
51	1.5	—	Typical	Death 18 hrs.
52	1.5	—	Typical	Death 18 hrs.
53	1.5	—	Typical	Death 18 hrs.
54	1.5	—	Typical	Death 18 hrs.
55	1.5	—	Typical	Death 18 hrs.
56	1.5	—	Typical	Death 18 hrs.
57	1.5	—	Typical	Death 18 hrs.
58	1.5	—	Typical	Death 18 hrs.
59	1.5	—	Typical	Death 18 hrs.
60	1.5	—	Typical	Death 18 hrs.
61	1.5	—	Typical	Death 18 hrs.
62	1.5	—	Typical	Death 18 hrs.
63	1.5	—	Typical	Death 18 hrs.
64	1.5	—	Typical	Death 18 hrs.
65	1.5	—	Typical	Death 18 hrs.
66	1.5	—	Typical	Death 18 hrs.
67	1.5	—	Typical	Death 18 hrs.
68	1.5	—	Typical	Death 18 hrs.
69	1.5	—	Typical	Death 18 hrs.
70	1.5	—	Typical	Death 18 hrs.
71	1.5	—	Typical	Death 18 hrs.
72	1.5	—	Typical	Death 18 hrs.
73	1.5	—	Typical	Death 18 hrs.
74	1.5	—	Typical	Death 18 hrs.
75	1.5	—	Typical	Death 18 hrs.
76	1.5	—	Typical	Death 18 hrs.
77	1.5	—	Typical	Death 18 hrs.
78	1.5	—	Typical	Death 18 hrs.
79	1.5	—	Typical	Death 18 hrs.
80	1.5	—	Typical	Death 18 hrs.
81	1.5	—	Typical	Death 18 hrs.
82	1.5	—	Typical	Death 18 hrs.
83	1.5	—	Typical	Death 18 hrs.
84	1.5	—	Typical	Death 18 hrs.
85	1.5	—	Typical	Death 18 hrs.
86	1.5	—	Typical	Death 18 hrs.
87	1.5	—	Typical	Death 18 hrs.
88	1.5	—	Typical	Death 18 hrs.
89	1.5	—	Typical	Death 18 hrs.
90	1.5	—	Typical	Death 18 hrs.
91	1.5	—	Typical	Death 18 hrs.
92	1.5	—	Typical	Death 18 hrs.
93	1.5	—	Typical	Death 18 hrs.
94	1.5	—	Typical	Death 18 hrs.
95	1.5	—	Typical	Death 18 hrs.
96	1.5	—	Typical	Death 18 hrs.
97	1.5	—	Typical	Death 18 hrs.
98	1.5	—	Typical	Death 18 hrs.
99	1.5	—	Typical	Death 18 hrs.
100	1.5	—	Typical	Death 18 hrs.

No. 12597 which was isolated in August 1940 from a culture submitted by Captain D. M. Johns from a fatal case of gaseous gangrene at Letterman General Hospital, San Francisco, California. The original culture was contaminated by *Bacillus porogenes* and *Micrococcus epidermidis*.

Experiment 1. December 9, 1941. A series of guinea pigs was injected subcutaneously with a pure culture of *Bacillus histolyticus* No. 12597 grown for 24 hours in a glucose meat broth medium. Two of these animals served as controls while 4 received also varying amounts of serum B simultaneously as shown in Table VI.

Table VI shows that serum B protected a guinea pig against at least 10 fatal doses of *Bacillus histolyticus* culture which was inoculated subcutaneously. The marginal animal showed a slight transient edema but there was no lysis.

Although guinea pigs inoculated with *Bacillus histolyticus* subcutaneously generally show a striking and peculiar denudation of skin at the site of inoculation they usually do not die. But both guinea pigs used as controls in this experiment did so.

Control 98 which received 1 cubic centimeter of culture showed at 15 hours an area 3 centimeters across completely denuded of skin and was obviously sick. It died at 16 hours at which time an area, by 11 centimeters was denuded but there was no perforation of the peritoneum and all of the viscera was normal in appearance. A culture from the heart's blood was sterile.

TABLE VII—PROTECTIVE ACTION OF GAS GANGRENE ANTITOXIN B AGAINST *BACILLUS SORDSELLII*

Guinea pig	Wt. lb.	Dose of serum	Result	Time of death
1	1.5	—	Typical	Death 18 hrs.
2	1.5	—	Typical	Death 18 hrs.
3	1.5	—	Typical	Death 18 hrs.
4	1.5	—	Typical	Death 18 hrs.
5	1.5	—	Typical	Death 18 hrs.
6	1.5	—	Typical	Death 18 hrs.
7	1.5	—	Typical	Death 18 hrs.
8	1.5	—	Typical	Death 18 hrs.
9	1.5	—	Typical	Death 18 hrs.
10	1.5	—	Typical	Death 18 hrs.
11	1.5	—	Typical	Death 18 hrs.
12	1.5	—	Typical	Death 18 hrs.
13	1.5	—	Typical	Death 18 hrs.
14	1.5	—	Typical	Death 18 hrs.
15	1.5	—	Typical	Death 18 hrs.
16	1.5	—	Typical	Death 18 hrs.
17	1.5	—	Typical	Death 18 hrs.
18	1.5	—	Typical	Death 18 hrs.
19	1.5	—	Typical	Death 18 hrs.
20	1.5	—	Typical	Death 18 hrs.
21	1.5	—	Typical	Death 18 hrs.
22	1.5	—	Typical	Death 18 hrs.
23	1.5	—	Typical	Death 18 hrs.
24	1.5	—	Typical	Death 18 hrs.
25	1.5	—	Typical	Death 18 hrs.
26	1.5	—	Typical	Death 18 hrs.
27	1.5	—	Typical	Death 18 hrs.
28	1.5	—	Typical	Death 18 hrs.
29	1.5	—	Typical	Death 18 hrs.
30	1.5	—	Typical	Death 18 hrs.
31	1.5	—	Typical	Death 18 hrs.
32	1.5	—	Typical	Death 18 hrs.
33	1.5	—	Typical	Death 18 hrs.
34	1.5	—	Typical	Death 18 hrs.
35	1.5	—	Typical	Death 18 hrs.
36	1.5	—	Typical	Death 18 hrs.
37	1.5	—	Typical	Death 18 hrs.
38	1.5	—	Typical	Death 18 hrs.
39	1.5	—	Typical	Death 18 hrs.
40	1.5	—	Typical	Death 18 hrs.
41	1.5	—	Typical	Death 18 hrs.
42	1.5	—	Typical	Death 18 hrs.
43	1.5	—	Typical	Death 18 hrs.
44	1.5	—	Typical	Death 18 hrs.
45	1.5	—	Typical	Death 18 hrs.
46	1.5	—	Typical	Death 18 hrs.
47	1.5	—	Typical	Death 18 hrs.
48	1.5	—	Typical	Death 18 hrs.
49	1.5	—	Typical	Death 18 hrs.
50	1.5	—	Typical	Death 18 hrs.
51	1.5	—	Typical	Death 18 hrs.
52	1.5	—	Typical	Death 18 hrs.
53	1.5	—	Typical	Death 18 hrs.
54	1.5	—	Typical	Death 18 hrs.
55	1.5	—	Typical	Death 18 hrs.
56	1.5	—	Typical	Death 18 hrs.
57	1.5	—	Typical	Death 18 hrs.
58	1.5	—	Typical	Death 18 hrs.
59	1.5	—	Typical	Death 18 hrs.
60	1.5	—	Typical	Death 18 hrs.
61	1.5	—	Typical	Death 18 hrs.
62	1.5	—	Typical	Death 18 hrs.
63	1.5	—	Typical	Death 18 hrs.
64	1.5	—	Typical	Death 18 hrs.
65	1.5	—	Typical	Death 18 hrs.
66	1.5	—	Typical	Death 18 hrs.
67	1.5	—	Typical	Death 18 hrs.
68	1.5	—	Typical	Death 18 hrs.
69	1.5	—	Typical	Death 18 hrs.
70	1.5	—	Typical	Death 18 hrs.
71	1.5	—	Typical	Death 18 hrs.
72	1.5	—	Typical	Death 18 hrs.
73	1.5	—	Typical	Death 18 hrs.
74	1.5	—	Typical	Death 18 hrs.
75	1.5	—	Typical	Death 18 hrs.
76	1.5	—	Typical	Death 18 hrs.
77	1.5	—	Typical	Death 18 hrs.
78	1.5	—	Typical	Death 18 hrs.
79	1.5	—	Typical	Death 18 hrs.
80	1.5	—	Typical	Death 18 hrs.
81	1.5	—	Typical	Death 18 hrs.
82	1.5	—	Typical	Death 18 hrs.
83	1.5	—	Typical	Death 18 hrs.
84	1.5	—	Typical	Death 18 hrs.
85	1.5	—	Typical	Death 18 hrs.
86	1.5	—	Typical	Death 18 hrs.
87	1.5	—	Typical	Death 18 hrs.
88	1.5	—	Typical	Death 18 hrs.
89	1.5	—	Typical	Death 18 hrs.
90	1.5	—	Typical	Death 18 hrs.
91	1.5	—	Typical	Death 18 hrs.
92	1.5	—	Typical	Death 18 hrs.
93	1.5	—	Typical	Death 18 hrs.
94	1.5	—	Typical	Death 18 hrs.
95	1.5	—	Typical	Death 18 hrs.
96	1.5	—	Typical	Death 18 hrs.
97	1.5	—	Typical	Death 18 hrs.
98	1.5	—	Typical	Death 18 hrs.
99	1.5	—	Typical	Death 18 hrs.
100	1.5	—	Typical	Death 18 hrs.

Control 103 which received 0.1 cubic centimeter also showed at 15 hours an area about 3 centimeters across denuded of skin but this animal was apparently not sick. However at 40 hours it was found dead with an abdominal perforation and its intestines hanging out which is common in animals receiving intramuscular injections of *Bacillus histolyticus*. The *Bacillus histolyticus* was recovered from the heart's blood.

Guinea pigs Nos. 101 and 109 both developed large areas (6 by 10 cm.) of denudation without perforation at death. Cultures from the heart's blood were negative in both cases.

PRELIMINARY EXPERIMENTS ON *BACILLUS SORDSELLII*

Serum B was the only serum claiming to have antibodies for *Bacillus sordellii*.

Experiment 13. For this experiment mystram No. 1316 was selected. This strain was received in 1927 from Dr. Frank L. Meleney of Presbyterian Hospital, New York, as *C. edematoides* No. 1 isolated from patient (10). Its identity with the previously named *Bacillus sordellii* was shown both by Humphreys and Meleney (8) and by Hall, Jungherr and Rymer (6, 7).

Five guinea pigs were inoculated subcutaneously with a 48 hour meat broth culture as indicated in Table VII.

Table VII shows that 1 cubic centimeter of serum B protected a large guinea pig against at least 1000 fatal doses of *Bacillus sordellii* culture. This animal showed only a slight transient edema.

STUDY OF THE LATE SYMPTOMS OF CASES OF IMMERSION FOOT

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JAMES A HEMPHILL MD Capt in MC AUS Mount Holly New Jersey

DURING the early part of February 1943 there were admitted to the hospital at this post a number of patients with immersion foot incurred as a result of the sinking of the patients transport. The condition varied from mild to severe and the patients were treated in two main groups as follows. In the first group the legs were exposed to fairly cool air under cradles. In the second group the legs were wrapped loosely in sterile cotton. Both groups were further treated by bed rest.

A small third group made up mainly of civilians, contractors, employees and merchant mariners whose going and coming in the hospital could not be completely controlled due to the large number of cases and general confusion, undertook a type of treatment of their own, namely Finnish type steam bath. The patients made a much more rapid clearing of local and general symptoms than did the group treated with bed rest and cooling. It is felt that this type of treatment should have further investigation.

After the discharge to duty of the Army patients and as time went on it was noticed that a number were having persistent symptoms referable to their lower extremities. This persistent symptom was noticed first among mess personnel in the hospital whose duty required long periods of standing on their feet. Inquiry then showed (about 14 months after onset) that a considerable number of the men who were on the sunken boat whether they had been hospital patients at the original onset or not and who were still on duty at this post had persistent complaints of one type or another referable to their lower extremities.

It was then determined to carry out the present study of personnel remaining at the post at the present time with the following findings:

General. Of the 63 persons remaining at this post in April 1944 14 months after the sinking it was found that 49 or 75 per cent of the total group had complaints referable to their lower extremities and that of these 49 patients examined 42 had abnormal physical findings in their legs or feet which was 64 per cent of the total group remaining or 83 per cent of those presenting complaints.

These men were of various communities and enlisted grades and all branches of service in the Army. Their ages varied from 20 to 35 years with an average age of 34. Their previous civilian occupations and places of residence in the United States were inquired into and neither was found to be a factor in the present study.

Previous medical history. A check of the previous medical history revealed nothing in any of these patients that was a factor in their present complaints. There were 6 old injuries to lower extremities but none of these were considered a factor in the present complaint.

Experience at the time of sinking. A study was made of the experiences at the time of the immersion in order to determine the various factors which might throw some light on the present complaints. Inquiry was made as to the question of injury at the time of sinking and 9 were found to have received minor injuries at that time, none of which were considered to be factors in their present complaints.

All 63 men had their legs more or less in the water following the sinking either in the sea or in lifeboats partially filled with water or in rafts partially filled with water.

The legs were in the water in this manner from 1 to 6 hours with an average time of 3 1/2 hours. The water temperature varied from 28 to 38 degrees, evidently depending on whether or not the men were in the Gulf of the Gulf Stream.

An attempt was made to determine how these men were clothed particularly with reference to their lower extremities in order to see how such clothing might affect their original condition and follow up results. The largest group was wearing government issue clothes with ordinary government issue shoes and light woolen socks. There were 26 in this group 4 of them had complaints and 19 showed abnormal physical findings. In the next group made up of Air Force enlisted men high leather boots and heavy woolen socks were worn. There were 7 of these men all 7 had complaints and 4 showed abnormal physical findings. In another group made up of men light wool socks only were worn all had abnormal complaints and physical findings. In another group of 5 men government issue shoes only were worn and all had complaints and abnormal physical findings. The 2 men remaining did not recall what clothing they had on their lower extremities while in the water both had complaints and abnormal physical findings.

No deduction can be made as to the benefit any particular type of clothing for the lower extremities would afford under the circumstances as they existed.

Of 51 men checked the effect of the cold immersion was so marked that in getting aboard the Coast Guard boats picking up survivors 38 of them needed assistance and were hauled up on the boats by ropes. Only 13 were able to get into the rescuing boats unaided and it is notable that of these 13 8 were in a lifeboat with water only up to their knees for a period of 3/4 hours. The rest of the men who did not need assistance were either in the sea or practically submerged on rafts for a period of 4 to 5 hours. Of this group who did not require assistance in getting aboard the rescuing boats 9 had symptoms at the time of examination and 7 had abnormal physical findings. All the men who needed assistance in getting on board the rescuing boats complained mainly of numbness or lack of coordination in their legs so that they had difficulty in walking and the treatment on the boats consisted in the removal of wet clothes rub downs hot drinks and general warmth.

Of the total group examined 1 were admitted to the hospital for treatment after their arrival. They had immersion foot of varying degrees and the length of treatment varied from 1 to 17 days with an average stay of 6 1/2 days.

Subsequent treatment During the 14 months since the original onset only 1 man of the whole group was admitted to the hospital for symptoms referable to the secondary effect of immersion foot.

Eleven men came to sick call of this group at varying periods during the 14 months the average number of visits to sick call being 1 to 5 and the main complaint being pruritis in the leg usually treated by physiotherapy.

Present symptoms At the present time the following are the complaints presented by the group still under treatment.

Burning sensation or burning pain in the feet or legs while walking. Twenty two men complained of this in varying degrees a large number of the group had the symptom in mild form and thought nothing much about it until the complaint was elicited by question. In a very few it was a marked complaint.

Numbness of the legs. This was one of the main complaints and existed in 7 of the group examined. It was of varying degree mainly existing at rest and particularly at night in bed in conjunction with rest pain.

Intermittent claudication. True intermittent claudication to the extent that the patient needed to stop and rest after walking a short distance due to calf cramps existed in only 8 and was quite severe in degree. Of the form of intermittent claudication known as *forme fruste* characterized by weakness of the leg muscles on walking a short distance and requiring stopping to rest before going on there were found 25 complaints. Of the form of intermittent claudication characterized by pain in the buttocks and legs simulating sciatica there were 4.

Rest pain. This was found as the most common and severe complaint of the group examined. It was found in 30 of the group and was characterized mainly either by cramp like muscle pains or general aching of the lower extremities occurring at night while patient was in bed and associated with numb

TERATOMA OF THE OVARY

ARTHUR H CURTIS M D FACS Chicag Ill no 5

TERATOMA of the ovary otherwise known as teratoblastoma embryoma or solid dermoid has been of surpassing interest to pathologists since early days. This has been true not merely because of its rarity and because its derivation has remained obscure but particularly because a more complete understanding of these remarkable tumors may be the key which will serve to explain the nature of other rare ovarian growths.

Although encountered in other organs and tissues of the body teratoma is predominantly an ovarian tumor and it is here that it is found in most developed and characteristic form. It is usually a compact solid rapidly growing neoplasm composed of tissues which are frequently wholly undifferentiated or corresponding to various stages of fetal development and revealing only isolated tendency to more completely developed organ like formation. The material entering into the structure of dermoids and teratoma is the same all three germinal layers represented in both the difference lies apparently in the tissue of origin and in the fact that dermoid are comprised of mature tissues whereas a teratoma consists of embryonal elements. The great characteristic of teratoma is the loss of proportion in its structure. There is topographical confusion.

Opinions differ in judgment of the malignancy of teratoma it is a growth characterized by capacity for great proliferation not ascribable to carcinomatous or sarcomatous degeneration but an inherent property of the cell which constitute it. Therefore it is to be regarded as potentially malignant in all cases unquestionably malignant in most instances.

The tumor is usually nodular or lobulated often with projecting cysts of astonishingly large size for so malignant a neoplasm (due to rapid growth?) often the size of a man's head. It may be spherical ovoid or of ovarian shape is usually pedunculated as in our case of

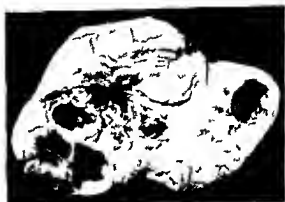
varied color—gray yellow red blue brown. The consistency is usually soft but may be firm. This feature varies not only with various tumors but also in the same growth e.g. marrow soft to firmly elastic. A capsule is usually present but may not be clearly defined. Perforation of the capsule is frequent but this means usual. The cut surface reveals a multitude of variations. It is polymorphous polychromic. Cystic spaces are of various sizes the contents may be clear limy geloid fatty honeycombed or purulent. There may be gray straw yellow pinheaded black points or homogeneous or hemorrhagic red brown tissue in solid lamellated brain like or marrow like masses. Strands of dense fibrous tissue are usual. Areas ranging from larger portions or organs or viscera (rare) to minute microscopic rudiments may be found.

Microscopically the picture is that of cancer. The tissues are mostly fetal in character but not entirely and invariably so. It is characteristic for well differentiated tissues to be immediately adjacent to lawless and wild areas of potentially or definitely malignant epithelial endothelial or arcomatous pattern.

One element of a teratoma may appear in growth of the other. Such one sided development is unusual yet it presents the very important question as to how far apparently simple tumors of the ovary may be of teratomatous origin.

It is difficult to gauge the number of these growths which have been discussed in the literature since the days of Virchow perhaps 60 to 300 all told. In Kermanner's clinic in Vienna among 1300 ovarian tumors through out a period of 30 years only were teratoma. Intermediate or transition forms between dermoid cysts and teratoma occur rarely if ever probably there are some.

Metastases occur most often in the abdomen but may appear in distant parts of the body. They present either a counterpart of the original tumor or a more simple structure i.e. a purely sarcomatous or carcinomatous growth.



T T i m f y

a lial tumor a chorioepithelioma or a malignant tumor of undifferentiated cell

Teratoma: a tumor of childhood and early maturity mostly before the age of 35. Not more than 5 recorded cases have been found after the menopause

The etiology of teratoma remains unsolved. The growth must be derived from a cell that can produce all three embryonic layers as expressed by Askanazy the origin must be from a totipotential cell. Only two theories of origin are prevalent that isolated blastomeres (Marchand Bonnet theory) are the source of these trigeminal growths or that they arise from primitive unfertilized ova

Our tumor was removed from a woman of 63 the mother of 4 healthy children. Her father and one brother died of carcinoma. Three years earlier there had been some genital bleeding and vaginal removal of a fibroid tumor and polyps. No malignancy was found. At the time of our examination the patient complained of vaginal burning without discharge and a tumorous enlargement of the abdomen. There were no symptoms or evidences of endocrine abnormality.

At operation February 6 1945 the liver was firmly and inseparably adherent to the anterior abdominal wall the pancreas was indurated the upper abdomen otherwise negative. There were some adhesions about the cecum. The left ovary was converted into a freely movable pedunculated irregularly nodular massive tumor with a smoothly lobulated external surface. The right ovary was atro-

phic. The generous sized uterus contained one small interstitial myoma and one bean sized sessile polyp. The endometrium was rather thick for an elderly woman.

The irregularly nodular smoothly lobulated 14 by 9 by 6 centimeter tumor represented the left ovary (Fig 1). The outline was roughly triangular in shape one surface strand demarcating the mass into a major kidney sized and a minor asymmetrical orange sized smaller lobe. Some of the lobules projected from the surface as firm nodules up to 4 centimeters in diameter. The entire surface was firm except over one tenth of its area which was cystic. The color of the fresh specimen varied from bluish to reddish gray.

On bisection the surface presented a solid apparently malignant tumor with numerous cystic cavities up to 3 centimeters in diameter variously filled with clear turbid slimy colloid or hemorrhagic fluid and a varied amount of necrotic debris. Some of the solid cut surface was fibrotic and firm but the major portion was of the consistency of a parenchymatous organ such as the liver or kidney. The color greatly varied from pink to gray brown a kidney brown color predominant. Many pinhead to pinpoint black spots were visible. Trabeculations of the stroma were clearly evident.

The microscopic picture verifies Askanazy's emphasis that often the constituents cannot be distinguished as was evidenced by the long confusing discussion of the distinguished pathologists during the conference at which he



F Ph t m ograph f t f a f t h t t m

presided. No portions of orans such as are sometimes illustrated are present in our specimen thus evidencing the embryonal nature of this growth. It is a true blastoma. A variety of cellular structure is evident in amazing detail and with great clarity in contrast with all illustrations which have been available to me in the literature. Organoid forms are suggested but surely not to be undeniably identified as such. In Figure a are tubules resembling glands along the intestinal tract. Figure c presents epithelial configurations of medullary tube like structures. Figure e reveals a mesonephroid type of tubule not unlike those of arrhenoblastoma. Massive islands of epithelial cells such as in Figure 2b but often of much greater size dominate the field in the majority of microscopic sections. Masses of immature cells such as those in 11,

ure d and extensive wildly grown sarcoma like and carcinoma like areas in abundance appear under the microscope adjacent to well differentiated island of cells such as those of Figure b.

The more one studies the polymorphous microscopic picture presented by this tumor the greater the temptation to join the ranks of those who ascribe a teratomatous origin to many rare kind of tumors of the ovary. This statement does not gainsay the evident origin of Brenner tumor and some pseudomucinous cystadenomata from the peritoneal epithelium of the uterine adnexa.

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ONE STAGE OPEN RESECTION OF LESIONS OF THE LEFT COLON WITHOUT COMPLEMENTARY COLOSTOMY

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COLON resection has gone through a process of evolution that will prove to be nothing short of remarkable for the half century in which it has been performed. The earlier procedures consisted of primary anastomosis of the open colon with such disastrous mortality from peritonitis that the contribution of Mikulicz (12-13) in 1903 was widely accepted as the procedure of choice when he reported a 16.6 per cent mortality for 24 patients operated upon by the principle of exteriorization. Mikulicz was not the originator of this plan of resection, but his relatively large series of cases was so convincing that the procedure has been identified with his name. The Rankin obstructive resection (1930) was an improvement, but even at that time Rankin recognized the desirability of a primary resection, but deterred because he did not think it could be done safely.

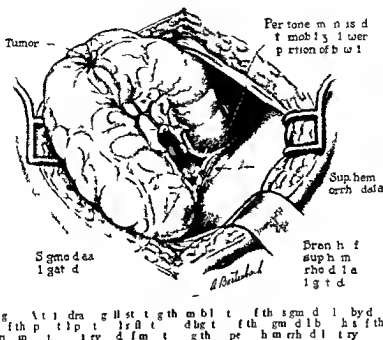
The next phase in this development was the performance of one stage ileocolostomies with resection of lesions of the right half of the colon. A few surgeons doubted the safety of this plan as evidenced by Allen's recommendation of a transverse ileocolostomy preceding resection of the right colon (1-2), the use by Whipple (20-21) of the Miller-Abbott tube as complementary decompression and the isolated position of Lahey in insisting upon exteriorization procedures for ileocolostomy. By and large this procedure as a one stage operation has been so successful in the hands of so many surgeons that little argument can now be raised as to its safety.

The next development consisted of primary resection and anastomosis of a colonic lesion with a complementary appendicostomy, cecostomy (10) or colostomy as recommended by

Wilkie, Allen (1), Whipple (5), Cheever, Dixon (6), Stone and McLanahan and White. In the hands of those insisting upon this auxiliary vent the mortality rate decreased one half or more when this feature was added. Dixon (3) must be credited with the extension of this procedure to lesions of the pelvic colon but always concluded his operation with a transverse colostomy which was closed 3 to 6 weeks later.

The most recent development has been in the execution of a one stage resection and anastomosis without the proximal vent. Cheever and Stone and McLanahan were discouraged by the higher mortality rate attendant upon this method, but Campbell did not find that the creation of the external vent was essential. In what perhaps represents the most thorough presentation of this subject to date, Wangensteen (19) reported favorably upon 61 patients operated upon by this plan with an overall mortality of 16 per cent, although 1 patient was given a proximal appendicostomy, 2 had cecostomies and 6 came to operation with previous colostomies performed for release of obstruction. Wangensteen, however, makes an issue of the importance of a closed method of anastomosis using a clamp technique and theoretically attaining asepsis.

We should like to give a preliminary report of our first 20 operations, from the private surgical service of one of us (K.A.M.), performed during the past 2 years using an open method of anastomosis. Though the period of observation is short and the series of cases limited, we believe that the trend has been clearly indicated. We were encouraged to attempt this plan of treatment by the availability of such modern adjuncts to bowel surgery as succinyl ulfathiazole, multiple blood transfusions, fluid and electrolyte balance, parenteral sulfonamides, spinal anesthesia, oxygen inhalation, intestinal decom-



tive days. The 2 patients who inadvertently did not receive succinylsulfathiazole were those with incorrect diagnoses. Resections were performed successfully in both of these with out complications.

Blood transfusions. The average amount of blood transfused in this group of patients was 1,350 cubic centimeters and varied from 500 to 3,500 cubic centimeters. Since we were dealing with private patients, the need for massive transfusions was probably not as great as we have seen in patients from our charity wards who enter the hospital in a later stage of the disease are more apt to show anemia and present a more profound nutritional problem. When more than one transfusion was necessary we preferred to give it one or more days preoperatively so that its effects would be more manifest. Although no amino acids were used in this group of patients we have already reported its use in other cases and are well aware of its potentialities (11).

Operative procedure. In 18 of the 20 patients spinal anesthesia was used. In 2 of the 18 pontocaine was used. In the remainder a 1:500

solution of nupercaine with the technique of Hand and Sise. In 2 patients in which an inhalant was deemed advisable combinations of ether and ethylene and ether with cyclopropane were used. Our only death was in the patient receiving ether and ethylene.

The duration of the operation varied from 1 hour and 10 minutes to 2 hours and 40 minutes with an average of 1 hour and 45 minutes.

The details of the operative technique are shown in Figures 1 to 4. It should be mentioned that no crushing clamps were used. Interrupted catgut sutures were used through all layers and interrupted No. 35 stainless steel wire sutures were placed as a second seromuscular layer. The latter were used as Lembert sutures. Sulfanilamide crystals in quantities up to 5 grams were sprinkled between the first and second rows of sutures and about the anastomosis itself. At the conclusion of the operation the rectal sphincter was dilated and a rectal tube was inserted to a point below the level of resection.

Pathology. The size of the lesions varied from involvement of a 1.5 centimeter segment

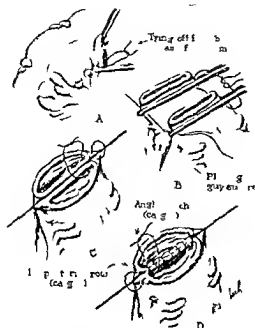


Fig. 3. A. Th. l. p. p. d. f. t. m. by Lee. g. th. p. p. l. f. t. h. d. i. g. t. th. m. s. s. t. d. p. r. i. th. b. o. l. f. t. h. b. l. o. o. d. p. p. l. y. t. h. y. i. n. b. t. Th. b. o. l. th. c. t. e. d. b. e. t. t. h. t. n. e. s. t. i. l. m. p. d. i. f. f. l. y. u. t. l. B. t. g. u. y. t. e. a. p. l. d. t. h. s. a. t. h. l. d. t. h. d. t. l. d. p. u. m. l. o. o. p. t. g. t. h. I. C. i. h. e. p. l. m. t. f. g. l. t. t. h. e. s. d. m. i. d. h. h. t. h. e. t. i. t. d. d. f. m. t. h. m. l. u. r. f. f. e. l. p. h. g. h. t. t. h. u. t. h. f. t. h. p. p. o. t. l. p. d. m. g. d. t. h. m. s. a. l. f. f. t. h. t. l. o. o. p. i. h. e. k. i. t. h. f. t. h. u. n. s. d. f. t. h. b. l. i. m. D. Th. p. l. m. t. f. f. t. r. r. p. t. d. e. a. u. t. e. s. s. p. o. l. g. i. l. l. y. th. f. i. r. t. p. o. t.

of bowel wall to a 14 centimeter segment. The sigmoid colon was the site of the lesion in 11 cases, the transverse colon and splenic flexure in 1 case each, the descending colon in 4 and the rectum in 3. The lowest lying lesion in the series was 5 to 6 centimeters up from the anorectal juncture and the lesion histologically proved to be a lipoma. Fifteen of the lesions were adenocarcinomas, either papillary, mucoid or annular in type. One case was that of a stercoraceous ulcer due to an impacted fecalith and the remaining one was the aforementioned lipoma. In 3 patients the regional mesenteric lymph nodes contained metastases while in another 3 cases the enlarged nodes proved to be inflammatory in nature. Omental nodes were present in 1 patient, liver metastases in another and ovary metastases in another.

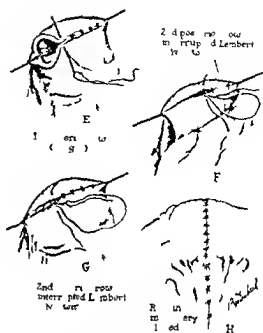


Fig. 4. E. Th. l. p. p. d. f. t. m. by Lee. g. th. p. p. l. f. t. h. d. i. g. t. th. m. s. s. t. d. p. r. i. th. b. o. l. f. t. h. b. l. o. o. d. p. p. l. y. t. h. y. i. n. b. t. Th. b. o. l. th. c. t. e. d. b. e. t. t. h. t. n. e. s. t. i. l. m. p. d. i. f. f. l. y. u. t. l. F. Th. p. l. m. t. f. t. h. d. f. t. t. u. g. f. t. r. u. p. t. d. L. m. b. t. t. h. f. N. 35. l. l. th. p. t. e. f. f. t. h. t. m. d. l. th. t. f. G. Th. d. f. t. t. h. m. t. r. y. a. l. o. s. e. d. th. t. r. u. p. t. d. t. g. u. l. Th. b. l. t. h. t. m. d. t. h. b. d. m. l. c. a. t. y. d. t. h. d. l. s. e. d. l. a. y. Th. l. t. h. l. d. h. m. p. h. u. s. e. d. t. h. m. p. l. m. t. y. l. t. y. h. b. e. m. p. l. y. e. d. t. h. f. s. e. s. h. h. h. p. o. t. e. d.

Postoperative course. All patients were placed after operation on continuous siphon and parenteral fluid were administered in quantities necessary to maintain fluid balance and good urine output and hyperventilation was obtained with mixtures of oxygen and carbon dioxide. Although peak rectal temperatures to 104 degrees Fahrenheit were seen occasionally, these were the exceptions. In most patients a remarkably afebrile course was characteristic after the second or third postoperative day. Gastric suction was discontinued as soon as the patient first passed flatus which was usually on the 3rd or 4th postoperative day. Oral feeding was usually started on the same day. In 6 patients the first formed stool was passed on the 3d postoperative day, in 1 on the 4th, in 3 on the 5th

in another 5 on the 6th in 2 on the 7th and in the remaining patient on the 10th postoperative day. The early return of bowel function was unassociated with diarrhea or bleeding except in 1 patient who later proved to have a non specific ulcerative colitis. When there was a delay in bowel function without evidence of organic obstruction patients were given pro trimine in repeated doses.

The period of postoperative hospital stay averaged 13 days and ordinarily ranged between 10 and 15 days. The patient who had the ulcerative colitis remained in the hospital 49 days.

Complications. Pulmonary atelectasis occurred in 2 patients, pulmonary edema in 1 and pulmonary embolism in 1; all of the 6 patients were 70 years of age or older. A wound infection which required readmission for drainage occurred in 1 patient. An urethritis in 1 patient followed repeated catheterization. In 1 a nonspecific ulcerative colitis became apparent during the postoperative course. There was 1 death (the case of embolism) which occurred on the third postoperative day giving a mortality of 5 per cent.¹

DISCUSSION

Orthodox teaching had heretofore condemned any attempt to resect anastomose and return the colon to the peritoneal cavity on the following ground:

1. The blood supply of the colon is too poor to depend upon satisfactory healing i.e. a leak at the anastomosis is far more imminent than in an anastomosis higher in the gastrointestinal tract.

2. The high bacterial flora of the colon could not be adequately controlled by enemas alone and peritonitis and wound infection were considered inevitable sequelae.

3. Postoperative distention would jeopardize healing at the suture line by increasing intraluminal tension.

With the advent of modern preoperative and postoperative care this concept requires re-evaluation.

Better anatomical appreciation of the blood supply of the colon has taught us that a pri-

mary anastomosis can be done if we stay within the boundary of the marginal branches of the left colonic sigmoidal and superior hemorrhoidal arteries as the case requires i.e. if care is shown in the ligation of vessel so that only the branches to be resected with the specimen are ligated and the mesentery is left intact to within a centimeter of the line of resection. Dixon (5) has pointed out that the middle and inferior hemorrhoidal arteries supply the pelvic colon so freely that branches of the superior hemorrhoidal arteries or even the terminal branches of the sigmoidal arteries can be ligated without fear of necrosis of an anastomosis of the colon beneath the brim of the true pelvis. He has also pointed out that a freer anastomosis occurs between the superior middle and inferior hemorrhoidal arteries than is commonly appreciated. Singleton in pointing out several anatomical principles in surgery of the colon has emphasized freeing a minimum amount of mesentery removing more of the antime enteric border of the bowel than of the mesenteric side and utilizing the appendices epiploicae when possible. When it is necessary to remove the epiploic fat Singleton cautions one not to ligate the artery entering the bowel at that point.

Many of us have gone through more than one era of new instruments and one wonders whether a crushing instrument does not have less place in primary surgery of the colon than elsewhere in the gastrointestinal tract. Whatever advantage may be gained by the so called aseptic anastomosis or closed technique is paid for at the price of crushed bowel edges which the colon will tolerate much more poorly than will the stomach or small bowel. We feel that peritonitis due to soiling at the time of anastomosis is no longer a major threat to bowel surgery with the protection afforded by the sulfonamides and still newer chemotherapeutic drugs which promise to attack even the gram negative bacilli. As Collier has pointed out the more serious form of peritonitis occurs from a continuous leak of intestinal content through a faulty anastomosis and not from soiling at the time of resection. Our attitude is that a crushing clamp predisposes to necrosis which may slough many days later.

The single most important contribution that encouraged us in this plan of therapy, the availability of succinyl ulfathiazole even though we went ahead with a primary resection in patients who inadvertently did not receive any of the drug preoperatively. Not only does this drug effectively reduce the coliform count of the stool (14) but its effect upon stool size and constancy is a favorable one. The combination of succinyl ulfathiazole in the colon and sulfanilamide in the peritoneum was unassociated with a single instance of peritonitis and only one of wound infection. This would appear to be significant. Some improvement in the clinical administration of the drug is possible such as giving the patient a 3 gram tablet instead of the 0.5 gram tablet. Sulfathalidin (phthalylsulfathiazole) which is believed to be just as effective as succinylsulfathiazole requires one half the dose of the latter and offers some advantage. We have dispensed with the initial administration of the 4 hour dosage and feel that the lower attainment of the desired level is less apt to produce diarrhea. Instead of calculating the dose on the basis of 4 gram per kilogram of body weight we have arbitrarily ordered the drug in doses of 11 and 18 grams per day depending upon the body weight. In the majority of the cases we did not resume succinyl ulfathiazole postoperatively for all of our patients were routinely treated with Levine tube gastric suction siphonage after operation. Sodium sulfadiazine was given intravenously in 5 gram doses on the first and second postoperative days as a routine.

The importance of blood transfusions can not be overemphasized. In addition to restoring or increasing the circulating volume, correcting an anemia that might be masked by dehydration elevating the circulating plasma proteins preventing shock, sparing the protein for use elsewhere and contributing many factors concerned in the body's resistance to infection, it offers one more as yet unexplored possibility. With the increased number of erythrocytes there is an increased oxygen capacity of the blood which should aid in maintaining the viability of a tissue the blood supply of which is limited. Adequate blood transfusion by increasing the protein content

of the body favorably affect wound healing, gastrointestinal motility, edema of the anastomotic stoma and obviate pulmonary complications. Time is necessary for the achievement of all these benefits and therefore transfusions should be given over a period of several days prior to operation. The infrequent occurrence of shock and its transitory nature (when it does occur) striking in the patients given sufficient blood prior to surgery.

Unless there is obstruction prior to operation in which event the patient is certainly not a candidate for primary resection postoperative distention can be prevented with a well functioning intragastric tube. We have learned from Wan Ensteen (18) that 80 per cent or more of intestinal gas swallowed at atmospheric air and evacuation of this air before it can enter the small and large bowel becomes an effective therapeutic plan. Although the passage of a Miller Abbott tube might offer theoretical advantage in having the decompression closer to the site of anastomosis and in utilizing the remainder of the gastrointestinal tract proximal to the suction holes for absorption of fluids and calories, the passage of this tube requires considerable effort and technical skill so that it is usually reserved for the obstinate patient. Further more experience has shown us that the rectal sphincter not infrequently resists entrance of the balloon of the Miller Abbott tube and its actual progression to the left half of the colon is arrested. The passage of the Levine tube which we prefer should be carried out before operation so that the administration of any allowed inhalant anesthetics if a general anesthetic is required will eliminate another cause of postoperative distention. Such a tube may prevent an aspiration pneumonia which can follow any anesthetic. The practice of preventing increased intracolonic pressures by passing a rectal tube proximal to the anastomosis (19) not carried out without trauma and should be done with caution. We have aided decompression by dilating the rectal sphincter by digital means and inserting a rectal tube but not to the level of the suture line.

The use of interrupted sutures has an undeniable advantage. With the use of such sutures too much faith is not placed upon a

single strand and the circumference of the lumen is not encroached upon. Use of fine stainless steel wire as an interrupted seromuscular suture avoids the capillary attraction of exudate through strands of catgut or silk and therefore is less apt to create a sinus through which infection might drain. A permanent suture is a safeguard against a delayed separation when catgut begins to weaken and dissolve. The use of a Lembert suture has given us very satisfactory inversion without creation of a diaphragm which is more apt to follow the use of a thick row of several sutures. Similarly the use of interrupted steel wire in the closure of the wound (8) not only lowers the incidence of wound infection but permits these patients to get out of bed earlier and thus tends to avoid the pulmonary complications that go along with prolonged bed rest. The closure of the resected mesentery with fine sutures which avoid inclusion of important blood vessels is still another important detail.

Our preference for spinal anesthesia is based upon excellent relaxation, a quiescent gastrointestinal tract and reduced likelihood for emesis or tracheal aspiration after operation. The duration of anesthesia provided by nupercaine (7) 1,500 or pontocaine has always been adequate. We have given general anesthetics only on the insistence of the patient.

Thus far we have discussed only why primary resection and anastomosis of the left half of the colon could be performed as safely without a proximal vent or safety valve as with it we have said nothing of its *advantages* of which there are many. First and foremost a more radical resection is possible for more dissection can be done for the purpose of removal and less for the purpose of developing a proximal and distal loop for the exteriorized segment. Implants at the site of a former obstructive resection have not been unusual and one wonders if this recurrence could not have been avoided if the segment had been resected instead of placed as a septal pur-

Second, exteriorization operations show a high incidence of complications among which are retraction of either or both loops, wound infection, herniation, prolapse, fecal fistula, obstruction and stricture formation. All of

these add to an overall mortality and morbidity.

Third, a temporary colostomy should be avoided if there is an alternate procedure that guarantees as low a mortality and as successful a result. Our mortality of 5 per cent is acceptably low, especially since pulmonary embolism takes its toll in spite of our best preventive efforts. If the mortality of subsequent closure of a colostomy is added to that of the initial procedure, the comparison will favor the procedure we have recommended.

The fourth point is that of economy. An average 13 day postoperative course is possibly a new low for this type of procedure. Avoidance of further return visits to hospital for closure of colostomies or correction of complications has considerable practical merit.

In spite of the many advantages there are contraindications for this procedure. Obviously a patient with a distended colon due to obstruction is not a candidate for any type of resection and only a preliminary decompression colostomy should be done. Earlier diagnosis of lesions of the left half of the colon which are more prone to produce obstruction than in the right half of the colon and are within the reach of the proctoscope and sigmoidoscope in the majority of instances will spare more patients this complication. If the lesion has perforated and produced a fistula, abscess or peritonitis, a one stage resection would be ill advised. Lesions which lie below the 10 centimeter level should be accurately appraised for size, fixation and regional extension because of the increased technical difficulties of an anastomosis at this level. No compromise should be made with the principle of a radical removal of all lymph bearing tissue for our first consideration should always be eradication of the carcinoma and our second consideration preservation of sphincter function. In obese patients with a short fat mesentery there may be difficulty in approximation of resected loops without tension.

SUMMARY

1. A preliminary report of 60 cases of one stage resection of the left half of the colon by an open technique is reported in which there was a mortality of 5 per cent.

2 Requirements which must be satisfied before this procedure is undertaken include succinyl sulfathiazole adequate blood transfusions and/or amino acid therapy intragastric suction siphonage oxygen inhalation an anesthetic agent with a quieting effect upon the gastrointestinal tract and use of fine permanent interrupted sutures in bowel and wound

3 The advantages of the one stage resection without complementary colostomy include (1) more radical resection of the tumor (2) obviation of complications inherent in exteriorization procedures (3) avoidance of a colostomy and (4) shortened postoperative course and fewer readmissions

4 This procedure should not be tried in presence of a distended colon in lesions fixed close to pectinate line of rectum in presence of infection and in a patient with a short ileum

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- 2 Id m S g ry 943 4 350-365
3 CAMP LL O J Minnesota Med 940 3 5
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TRANSURETHRAL RESECTION FOR PROSTATIC HYPERTROPHIES OF LARGE SIZE

REED M NESBIT MD FACS An Arbor Mich g n

DURING the years 1942-1943 and 1944 operations for the relief of prostatic obstruction were performed upon 1150 patients by my associates and myself at the University of Michigan Hospital. A detailed clinical analysis has been made of this entire series of cases and is being reported elsewhere. Ninety-six per cent of the patients were operated upon by transurethral resection while 2 per cent had perineal prostatic ectomy and 2 per cent were treated by supra-pubic enucleation. Among the 1104 patients who had transurethral resection 16 were found by tissue examination to have cancer of the prostate while 942, 85.4 per cent had benign lesions and of the latter there were 176 who had glands of large size i.e. 50 grams or more of tissue was removed at operation and this group of cases comprises the basis for the present report.

The youngest patient was 48 years old and the oldest was 88 while the average age of the entire group was 69.8 years. The amounts of tissue removed are particularized in Table I.

The operating time in all of these cases was less than 1 hour, save in 3 or 4 instances in which the operation was concluded in 65 to 70 minutes. It has been our belief that longer operation time subjects the patient to a disproportionate risk of shock so we have followed the practice of limiting the operating time to 1 hour and when removal of the adenomatous mass has been manifestly inadequate an early reoperation is carried out when the condition of the patient permits its safe performance. Secondary resection has invariably been well tolerated and none of the 5 patients who required two stage resections in this group of cases suffered from shock or other adverse clinical manifestations at the time of secondary resection. The average amount of tissue removed was 76.4 grams. In 2 cases 160

grams of tissue was removed in one operation and in one case 190 grams was removed in a two stage resection.

Blood loss determinations were made in 154 of the cases and are listed in Table II. It is the belief of the writer that hemorrhage constitutes one of the greatest hazards of the resection operation and that immediate estimation of operative blood losses should be carried out routinely and when excessive losses are observed transfusions of whole blood should be administered even though there are no objective signs of shock or impending shock. Forty-one of the patients were given postoperative blood transfusion. It has been our practice when operating upon patients who have very large glands in whom great loss of blood is anticipated to start a transfusion of blood at the beginning of operation so that the expected loss can be simultaneously replaced. Blood transfusions were administered during operation to 5 of the patients in this group.

The smallest blood loss in this group of patients is 5 cubic centimeters and the largest 1000 cubic centimeters which occurred in 2 cases. The average blood loss was 9 cubic centimeters. Postoperative hemostasis carried out by using the resectoscope was necessary in 6 cases.

A radio tube type of generator was used in all of these cases for the production of the cutting current and a damped current generated

TABLE I — CLINICAL DATA ON LARGE BENIGN HYPERTROPHY CASES — 1942-43-44

Gram	C
5 — 69	93
— 89	4
90 — 9	5
— 49	
5 — d O	5
T tal cases	76
A g m t f t s m d	76.4 g am
L g t m t — m d	60 g m (es)
pe t	
La gest m t — m d	90 gram
p t	

TABLE II—OPERATIVE BLOOD LOSSES ON
LARGE BENIGN HYPERTROPHY CASES

cc.	Cases
U d r 00	3
00 to 99	4
00 t 349	5
35 t 499	5
500 t 749	3
7 t 900	—
000	54
Sm. best blood loss	—
La. gest. blood loss (cases)	000
Average blood loss	39

TABLE III—COMPARATIVE CLINICAL DATA—
TRANSURETHRAL RESECTION—BENIGN LE
SIONS—1942-43-44

Age	La. gest. ds (176 cases) years	All benign cases (94) years
Average	60.8	68.4
Youngest	45	5
Oldest	83	9
Hospitalization period	Days	Days
Preoperative	4	4.4
Preoperative—1 gest.	37	66
Postoperative—1 gest.	35	35
Postoperative—1 gest.	6	5.5

by a spark gap condenser was employed for hemostasis. Whether the more highly damped cutting current that is produced by the Bovie generator would have resulted in smaller blood losses is not known. A comparative study of patients operated upon with the two types of cutting current would be of great interest.

Further data on the 176 cases having large benign glands indicate that external urethrotomy was performed for the introduction of the standard size resectoscope in 59 cases, 33.5 per cent; this constitutes a significantly more frequent need for external urethrotomy than in all of the resection cases in which urethrotomy was employed in 20 per cent. The greater need for external urethrotomy in the cases having large prostates is to be ascribed to the need for increased maneuverability of the instrument which is encountered in larger or longer prostate glands. Litholapaxy was performed in 3 cases for the removal of vesical calculi.

The period of hospitalization necessary for the treatment of prostatism constitutes one datum of interest and significance. The average preoperative hospitalization in this group of patients was 4.2 days, the longest being 37 days. The average postoperative period was 1.1 days with the longest postoperative period of any patient being 35 days. The average total hospitalization for the entire group of 176 cases was 16 days. This period of hospitalization compares very favorably with the average hospitalization for all prostates, whether large or small that are treated by transurethral prostatic resection in this hospital (15.5 days). It should be pointed out in

this connection that most of the patients treated in this hospital are from out of town and of necessity are kept in the hospital longer than are those patients who live in our immediate neighborhood. We usually discharge patients on about the 10th or 12th hospital postoperative day when they live out of town, whereas patients who live in our own community are usually discharged on the 5th to 7th postoperative day.

There were 2 deaths following operation in this series of patients; thus the mortality rate for the group was 1.2 per cent. In neither of these cases was the cause of death to be attributed to the magnitude of operation performed upon the patient. One of the patients was a most unfavorable risk, who had been on prolonged catheter drainage in an attempt to prepare him for some type of operation. He had besides his severe prostatism an organic brain syndrome and was completely uncooperative and required the constant attention of our nursing staff. Something had to be done to relieve his obstruction and continued catheter drainage was impossible. We were forced to decide between suprapubic drainage and transurethral prostatic resection and because of the difficulty of managing catheters of any type we elected to perform transurethral prostatic resection. One hundred and fourteen grams of tissue was removed with a blood loss that was estimated at under 300 cubic centimeters. The patient died about 2 weeks following operation and it was felt that his death resulted not so much from his operation as from his debilitated condition having to do with his organic brain syndrome. The other

death occurred in a patient who was suffering from uremia on admission to the hospital and who was kept on catheter drainage for a short period of time prior to operation. Urethral catheter drainage seemed inadvisable in this case and a decision was made to perform transurethral prostatic resection rather than suprapubic drainage in the belief that the resection operation would be no more shocking to the patient than would suprapubic cystotomy. This operation was performed early in 1942 at a time when we were performing the resection operation in spite of an elevated blood nitrogen level and unstabilized renal function. This and one other case in the second instance a patient who had a gland of small size both died of uremia in the early postoperative period and the cause of death was ascribed to early operation with inadequate preparation of the patient for prostatectomy. Since these two occurrences early in 1942 we have discontinued the practice of performing primary prostatic operations in the face of unstabilized suppressed renal function in the conviction that it is unsound practice.

In order to compare the clinical data on the group of patients having large glands with all of the benign cases treated by transurethral resection the data have been listed in Tables III and IV. It is to be noted that in only 3 instances are there important differences in the data on the 2 groups of cases. These are the average blood losses which are significantly higher in the large gland group and are of course to be expected the performance of external urethrotomy—33.5 per cent as compared to 20 per cent and the incidence of the administration of blood transfusions 39 per cent in the large gland group as compared to 10.8 per cent for all resection cases.

TABLE IV—COMPARATIVE CLINICAL DATA—(OPERATIVE)—TRANSRESECTION—BENIGN CASES—1942-43-44

	La g	gl d	All benign
	(76)	ses)	ca (94)
Blood losses (average)	39	68	C. 55
	C	P	C
Ext l th t my	59	33.5	88
Postoperat h mostas	6	4.3	
Transf ns	68	39	8
M rital ty			3
R resecti	5	8	3 3.3

T tal cases	6	C ses	6
No pl	9		
Repl es	6		
Deaths	1	g hosp tal (d t postat	1
diseas	1	ld d e t ce b l dent l v g	4
h p tal			
Th m th 3 ples f p tu ts wh a t			
th p es t t m l d tu			
Th q est d th ples mm ed f ll			
D y nneat mally w th t ff t?			5
O d y h t t t t n n t?			
D y h y b r n g pau n n t ?			45
N			5
Yes			3
S m t m			5
3 D y h m p l t n n a r y t l ?			3
If n t pl se x p l a i			3
O p t t had m p l t t f q m th —			
th bega t g h c n t l d w — y y r s			
p u — h n l y t n t u c Th s p t n th d			
pet d l m i x t n j e c t e d th p u n t			
p ent pe t u b l d i n g A f t e p e t u h b l e d			
ly f d y s d l y d e d a s e s l t h e m h g			
It is b e d t h t t h p e r l j e c t l t t			
o t h m t t h g m y h a e p l y d p t h			
p o t p e t u c o t u c			
Th m n g p t t w h l k c m p l t t l			
h t e s a t u n s l g h t t h t t n w y t			
f e s t h t h t i v u f l k — u n t h e d t f e c			
t f f f h s			
4 D y h m t d y f q c y ? Y			46
			N
5 If w m t u n e s d y u n a t b e t b e d u m			7
d m r n g ?			
N t u m s			4
O n			65
T t h t u m			4
F t u m s			4
M t h f u r t u m			0
6 l t h n c l e a ?			5
I t c d d y ?			3
S m t u m l d y			5
7 l y s l f t u n w m v i g			4
Le v i g t h a n b e f o p e r a t u ?			8
I t u n h a g d ?			93
N p l y t t h q t u n			

TABLE V—LATE FUNCTIONAL RESULTS

	P n l	o s t a t t m y	R e s e c t i
T tal cases f n s e c u t i)	oo	oo	
U n t t o o l q t l y			
f p t t p u n i)	5		7
Noctur			
N t t l l			45
O			31
Tw t f	4		3
M t h a f	33		1
D f l t y w t h r i n a t i	6		1
R e s k t — (p a t i t p)	6		
W l l	89		90
Imp e d			9
U n m p d			2

TABLE VI

Hospital Number	Age	Am. un- t. ins. km	Do you work ?		Burs pain		Com- pl. rol		N. m. l. d. f. que cy		No. ans			Se- fun to			Urn		Com
			yes	N	yes	N	yes	N	yes	N		1-1	Ok	1	Less	Use of ne d	C	U	
69			+			+	+	+				+			+			+	
67 S	66	8	+			+	+	+				+			+		+		
3 S		60	+			+	+	+				+			+		+		
	6		+			+	+	+				+			+		+		
5 16		8	+			+	+	+				+			+		+		
13	6		+			+	+	+		+						+	+		
8	7	8	+			+	+	+		+					+		+		
44 3		8	+			+	+	+				+			+		+		
66 8 3			+			+	+	+				+				+	+		
513365	8		+			+	+	+		+					+	ly	+		
86	6		+			+	+	+		+							+	+	
55 15	83	8	+		+		+	+					+		+			+	
5	8	8	+			+	+	+				+				+	+		
5 09		3	+			+	+	+				+				+	+		
6 99 S	9	83	+			+	+	+				+				+	+		
5 90	8		+			+	+	+		+						+	+		
5595	8	60	+			+	+	+		+						+	+		
568	7	90	+			+		+		+						+	+		St 18
	8	8	+			+	+	+		+					+			+	
	65		+			+	+	+		+						+	+		
006	6		+			+	+	+		+					+		+		
6			+			+	+	+				+				+	+	+	Cloud m
306	63		+			+	+	+		+						+	+		
36	65		+			+	+	+		+					+		+		
5 3			+			+	+	+		+						+	+		
890 6			+			+	+	+		+					+		+		
00			+			+	+	+		+					+		+		
6 66	6	5	+			+	+		+	+						+	+		D f 6
60	5	8	+			+	+	+		+						+	+		
3	60	90	+			+	+	+		+		+				+	+		
			+		+		+	+		+					+		+		1 b m mes
5			+			+	+	+		+					+			+	
094 3	6		+			+	+	+		+					+		+		
3 3	69		+			+	+	+		+						+	+		
6 699		90	+			+	+	+				+				+	+		
3	—		+			+	+	+				+				+		+	Cloud so times
6	5	3	+			+	+	+				+				+	+		
9906	—		+			+	+	+		+						+	+		

able interest to all urologists since many candidates for prostatectomy enjoy sexual potency and are interested in retaining it if possible. To be sure many men in this age group have for one reason or another lost a participating interest but not a few are surprisingly active sexually and the latter are often particularly anxious that this function be preserved. The urological literature is remarkably free from data upon the subject of the effect of prostatectomy on sexual vigor and in general prostatectomists appear to show an indifference in the matter. Most surgeons express the belief that persistence of sexual vigor following perineal prostatectomy is most unusual while that following suprapubic enucleation is relatively commonplace. In the present series of 176 cases there were 93 patients who stated that they noted no change in potency following resection while 25 had less and 24 an increase in sexual vigor. No replies to this question are available on the remaining cases. In the postoperative follow up survey of 1940 the resection cases were interrogated regarding the matter of sexual potency. Among the one hundred consecutive cases in that series there were 24 who reported an increased sexual potency while 10 had a decrease and the remaining 66 patients observed no alteration in sexual vigor.

SUMMARY AND CONCLUSION

An evaluation of clinical data on 176 patients with large prostates treated by transurethral resection at the University of Michigan Hospital discloses the fact that gland size was not a determining factor influencing the morbidity mortality or length of hospital stay.

Comparison of data on this group of cases with those of all benign cases reveal that the blood losses are greater when the large glands are resected and as a result that postoperative transfusions are more often required also that external urethrotomy is done more often in this group of cases 33.5 per cent than in all resection cases 20 per cent.

The end results following transurethral resection in this group of cases are considered to be excellent with only one case that can be regarded as a poor result. The end results in the patients having more than 80 grams of tissue removed were just as good as those of the other patients of this group and these facts support the impression that has long prevailed among experienced resectionists that patients with big glands enjoy just as good results following a proper resection as do patients having smaller prostates that the quality of end result following transurethral resection is determined not by the size of the prostate but rather by the adequacy of its removal.

THE MANAGEMENT OF POSTOPERATIVE CHOLEDOCHOLITHIASIS

Another Use for Solution G

BENJAMIN GOLDMAN BSc MD FACS JAMES JACKMAN MD E Pe Jlv
d RICHARD H EASTMAN AB AM PhD C mbridg M ch setts

THIS discussion is concerned with the specific problem of recurrent common duct stones as delineated by postoperative cholangiography with a brief review of existing methods of treatment and a report of 2 cases in which solution G was effective.

Previous to the advent of cholangiography the early diagnosis of postoperative recurrent choledocholithiasis was not often proved unless the obstructive symptoms of colic jaundice or biliary fistulas made reoperation imperative. Despite technical advances such as the wider acceptance of the several variations of spinal anesthesia for improved and sustained abdominal relaxation well illuminated and transilluminated operative fields the practice of dilatation of the sphincter of Oddi with Bockus dilators and even irrigation and air suction of the common and hepatic ducts and delayed cholangiogram provides the only assurance that stones are not left behind. Therefore carefully evaluated roentgenologic study of the biliary tree is indicated before removal of the Kehr tube.

Immediate or operative and delayed or postoperative cholangiography are available. The latter method is preferred because it enables the radiologist to make the examination where there is ready access to all technical facilities including those for fluoroscopy. Here injections can be made into the T tube and the medium followed visually as it passes through the ampulla into the duodenum. This is especially important in the final cholangiography.

Many types of radiopaque media have been used in outlining the biliary ducts. Bismuth paste and barium solutions were used by the

earlier workers in this field and more recently lipiodol hippuran potassium iodide and potassium or sodium bromide have been employed. Diodrast and thorotrast have also been used extensively. It is beyond the scope of this paper to discuss the advantages and disadvantages of the various media. Diodrast 30 per cent solution has been used routinely and with satisfactory results. Caution should be used if there is a history of allergy and suitable sensitivity tests may also be indicated.

The patient is placed on the roentgenographic table and in the supine position bile is aspirated by means of 30 or 50 cubic centimeter syringe. The ducts are then irrigated with 50 cubic centimeter of warmed normal saline solution. Sterile technique should be employed because of the possibility of extravasation of the solution or of the diodrast. The syringe is then filled with diodrast which has been previously heated to body temperature. Injection is made (10 cc) under roentgenoscopic guidance and spot roentgenograms made in the anteroposterior and oblique projections. An additional 10 cubic centimeters is then injected and another film is made. A Bucky diaphragm being used. A final injection is done and the last film is made in the oblique projection. If there is any delay in the dye entering the duodenum films may be made at 15 minute interval. Amyl nitrite or nitroglycerin may be given in case there is undue delay in duodenal filling in order to differentiate spasm from organic obstruction.

Postoperative common duct concretions develop from small nuclei of biliary debris or may descend from the higher hepatic radicals which are not reached by probe suction or irrigation. With the increasing practice of choledochostomy coupled with routine postoperative cholangiography many more of

D C 11m d geo H m H I D J k
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m ea h soc h m ry H d t

these disappointing cases are certain to confront the surgeon. Best (3) Pibram, Torres, Best and Hicken (4) and Negri and Negri have made pointed reference to the importance of the problem and to its solution.

Reported method of attack may be roughly classified as direct and indirect. Of the latter Best and Hicken advocate the use of dehydrocholic acid and antispasmodic drugs by mouth and irrigation of the T tube with sterile olive oil or lipiodine. More recently Best (3) has urged the use of the three day biliary flush regimen before as well as after operation.

Torres reports the use of Pibram's method but now prefers Best's procedures.

Pibram records successful results in 38 cases treated with ether instillations into the Kehr tube. This is followed by liquid paraffin by the same route. This direct method is based on the dissolution of cholesterol by ether and liquid paraffin helps to transform the stones into a soft pulp that can easily pass through the papilla of Vater.

Negri and Negri after encountering certain difficulties and inconveniences of Pibram's routine made a study of cholesterol solvents. *In vitro* studies indicated that Prevot's gomemol easily reduces cholesterol and cholesterol pigments. *In vivo* case is reported after a preliminary instillation of 1 cubic centimeter of Merk's doryl (carbaminoylecholine) followed by gomemol 10 cubic centimeter daily for 10 days.

The attention of one of us (B.G.) was drawn to this problem by several unsatisfactory experiences. Before cholangiography was a routine postoperative procedure the T tube was removed at the end of 10 days provided after clamping no colic ensued and the bile, urine and feces were of normal color. After roentgenographic examination was applied postoperatively to all choledochostomies, several cholangiograms revealed stone in the common ducts. Operatively these cases had been thoroughly explored, air suction applied and a Bock's dilator passed into the duodenum. Treatment in the beginning was irrigation of the Kehr tube and duct with sterile normal saline and later Pibram's method was used.

The latter was not always satisfactory usually producing a great deal of pain for the reason that ether boil at body temperature. In one patient in whom a small leak was demonstrated to have developed around the T tube the injection of even 1 cubic centimeter of ether produced very obvious shock.

It is for these reasons that a search was made for some substance which would act directly upon the retained calculi and reduce them chemically.

The criteria for such a substance should be (1) a liquid—one that is non-toxic and readily made or easily obtainable (2) it must bring about chemical reduction of cholesterol and calcium salts.

The work of Suby and Albright (10) and others (1, 2, 3, 8, 9, 12) with solution G in the dissolution of urinary calculi readily suggested itself since like urinary incrustations and concretions gall bladder and common duct stones also contain calcium. Best and Taylor classify gall stones as (1) pure cholesterol (2) cholesterol pigment calcium (3) pure bilirubin (4) bilirubin calcium (5) calcium carbonate. Of these bilirubin calcium stones are the most commonly found variety and theoretically solution G should be chemically effective on the greater proportion of common duct stones.

Before *in vitro* studies could be arranged 2 patients were subjected to operation and upon postoperative cholangiography were found to have retained common duct stones. Because Pibram's method of treatment failed in the first case it was decided to try solution G upon empiric grounds.

CASE ABSTRACT: Inflammation of the gall bladder with stones. Patient had been operated on 10 days before. Postoperative cholangiogram showed stones in the common duct. Treatment with solution G was successful. The patient was discharged on the 10th day.

Notes: The patient was operated on 10 days before. Postoperative cholangiogram showed stones in the common duct. Treatment with solution G was successful. The patient was discharged on the 10th day.



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The administration of solution G was borne
 by the patients without discomfort of any kind.
 They expressed the same opinion—a feeling of
 well being after the instillation of the first
 1000 cubic centimeters. There was no pain.
 A mild diarrhea occurred in Case 1 and in
 both the stool were green in color.

While the clinical results in the 2 reported
 cases were excellent *in vitro* experiments con-
 ducted later results were disappointing when
 it was found that solution G per se and in a 1
 mixture with bile over a wide concentration
 range had no apparent ability to dissolve bil-
 iary calculi of cholesterol type. Noted during
 experiments were bile flocculation and some
 change in appearance of cholesterol calculi sur-
 faces but no perceptible weight loss.

Since these experiments indicate that solu-
 tion G does not reduce cholesterol stones chem-
 ically other explanations of its mode of action
 may be considered.

While the pH of liver bile varies between 8
 and 8.6 and gall bladder bile between 5.0 and
 6.0 that of solution G is about 4.0. Such a
 solution might be sufficiently irritative to the
 mucosa of the common duct and sphincter of
 Oddi to activate the circular longitudinal and
 oblique unstriated muscular fibers found in
 these structures.

Since solution G so closely resembles liquor
 magnesi citratis (U.S.P.) might not the re-
 sults be explained upon its cathartic action.

SUMMARY AND CONCLUSIONS

1. Recurrent choledocholithiasis: dis-
 cussed from the point of view of the surgeon,
 radiologist and chemist.

A brief review of the literature referring
 to existing method of treatment is presented.

3. Two case histories are cited in which so-
 lution G was effective.

4. Explanations of the possible mode of ac-
 tion of solution G in the common duct are
 suggested.

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MARCH FRACTURES

WALTER SCOTT M D F A C S Lie te t C n m d M C U S N R
H llywood C l f n

MANY articles have appeared in the literature during the past 3 years on the subject of march fractures and it is significant that the authors concerned were of the Army or the Navy Medical Corps. In peacetime these fractures rarely occur but they increase rapidly in wartime especially during that period in which the recruit goes through a basic training program which entails a great deal of drilling and marching. Because the lesions are so often precipitated during a march—46 percent—it has been appropriately termed march fracture and even though many other names have been suggested from time to time the term continues to appear traditional of these nontraumatic fractures of the metatarsals. Similar fractures are being reported in other bones particularly the tibia femur fibula os calcis and more rarely in the pelvic bones and ribs and they together with the march fracture are commonly referred to by J B Hartley as descriptive term fatigue fractures of bone.

It is the author's purpose to report some observations made during the treatment of 58 cases of march fracture in the period from September 1944 to February 10 1945. All the patients were males who developed their trouble during some phase of the recruit schedule at a large Naval training center having a complement of 32 000 men.

First it will be noted that the general data recorded in Table I parallel those of other authors and are therefore not considered unusual. However the general body type encountered may reflect a slight glandular imbalance inasmuch as 57 percent were either tall or fat this finding together with the low pulse rate—62—may signify as will be pointed out later a mild adult hypothyroid state. In this series only the second and third metatarsals were affected there being no instances in which the first fourth or fifth were involved. One case is unusual in that the patient developed a march fracture in the second and third metatarsals following the other at an interval of 12 weeks (Fig. 1).

ETIOLOGY

Many hypotheses have been advanced in the past to explain this lesion and the following summary indicates that much uncertainty still exists as to its origin. We shall subdivide the various causes in the following manner:

- I P d po g l l
M r t y n d m (5 3)
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3 V s o p m l d g t b o t p h y (8)
4 S h o e g r r t t (4)
5 D s e d d f l u f f o o t ()
6 M s c l f t u g u (7)
7 S p a m f t r i m s c l (4)
8 F a u l l y k f o o t ()

- II P d po g c a e s y l
B c t r i l (5)
N l g d t b (3)
3 R h u m t d t h (9)
4 N t r u l d f a (6)
5 P l y h y p o t i m (9)
6 M l d h y p o t h y d t a t ()

- III P o p u l a t c a
T h s g l l y g d p o t b e c h g
d g t B d t h l t f h y t h m c a l l y
p e t d b t h e s h l d m e c h l l t t g b y
m m a t t p o t b y d t h c a j c t y f t h
b t b e t e s

Forty eight of our 58 cases were studied from the standpoint of metabolic rate. The test was made after a 4 hour period of bed rest and the average was found to be minus 10.72 per cent. The lowest reading recorded was minus 32 per cent and the highest plus 8 per cent. There were only 5 plus readings. Twenty seven or 56.2 percent were minus 10 percent or lower 15 or 3.2 percent had readings of less than minus 15 percent and 6 or 12 percent were below a minus 20 percent metabolism. It is realized that great differences of opinion have arisen as to what constitutes the signs of hypothyroidism in cases not presenting the frank typical picture of myxedema or cretinism yet it is true that in adults we are forced to accept a lowered rate of metabolism as the most significant of the physical findings. A decreased rate cannot result from emotional disturbances and it offers more reliable evidence of hypothyroidism than a high resting does of hyperthyroidism. The only associated symptoms of hypothyroidism and glandular dysfunction found

Th. P. von s e r t c o t e d h h o s e f h
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From L. S. N. al Hosp tal, Shoemak Calif r n a l a g e.



in our patients were the lowered pulse rate (average 72) and the fact noted above that 57 per cent were either tall or fat. There was no evidence of fatigue, weakness, nervousness, dry skin, or constipation noted. The relationship of a hypothyroid state to bone metabolism in an infant is clearly known for if that deficiency has extended over a considerable span of time the characteristic picture of cretinism will develop and skeletal changes especially in the epiphyses will occur due to a delay in the appearance of ossification in the cartilaginous center. The relationship, however, between hypofunction of the thyroid gland and the skeletal physiology in adult is not clearly known yet it

may be that lesser degrees of osteoporosis develop if that deficiency is continued over a long period of time as in the case in hyperpituitary and menopausal syndrome.

THE CLINICAL COURSE

A variable amount of time elapses between the start of recurrent trauma and the appearance of initial symptoms. That period may be from 7 to 105 days which represent the extremes found in this group. The average lapse of time however is 44 days and the first symptom is usually a burning pain which comes on in the course of a hike of 5 or more miles. The onset of that pain may be acute 46 per cent or insidious 36 per cent. The remaining 18 per cent could not be ascertained. A characteristic limp parallels the pain and these symptoms in turn are followed by soft tissue swelling on the dorsum of the foot. The severity of these cardinal symptoms (pain, limp, and swelling) increase for 7 to 14 days when a plateau is reached in which they remain motionless stationary for 4 to 7 days. Following this stationary phase improvement begins and if untreated it will progress slowly for 14 to 21 days. These 3 phases in the course of a march fracture are both typical and constant and they serve to determine beforehand the length of treatment which will subsequently be required. Ten or 17 per cent of the men were admitted during the first phase, 27 or 46 per cent during the second phase and 21 or 37 per cent were admitted for treatment while in the improving or third stage.

The stages herein described are based largely on subjective findings obtained from the patients themselves but are not free from considerable error. For example, the man minimizes his symptoms

TABLE I—GENERAL FINDINGS RECORDED IN 8 CASES OF MARCH FRACTURE

Number of males	59
Age range	19 to 24
Weight range in pounds	125 to 175
Body types	59
Normal	43
Tall	3
Fat	5
Days in trauma before symptom appeared	6 to 105
Participating causes	46
Mechanical	7
Obtuse lateral stress	4
Night	6
Lifting	3
Degree of activity	6
Complications	5
Complications (including those which are callous)	5
Arterial pulse rate recorded 33 cases per minute	60 to 80
Highest pulse rate	80
Lowest pulse rate	44
Metatarsal involved	46
Second	4
Third	3

in order to stay out of the sick bay. One must then be guided by the physical findings which are limp, localized tenderness, ability to walk on the tip-toe, soft tissue swelling, and the degree to which the long extensor tendons of the toes are obscured.

X-ray evidence of march fracture may not be forthcoming on an early plate, but is likely to appear after the 7th to the 10th day of illness. It has been our observation that roentgenologically the cases will fall into one of two major groups so far as prognosis is concerned. The smaller group—10 per cent—is the most significant (Fig. 2) for here the fracture line runs completely across the shaft of the bone. The larger group—90 per cent—will either show an incomplete fracture line (Fig. 3) or simply a periosteal shadow (Fig. 4). We find it expedient to group the last two types together as their response to treatment is usually the same.

TREATMENT

While there may be differences of opinion with respect to the etiology of march fractures, there is general agreement in regard to the treatment which conventionally consists of a short leg plaster-of-Paris cast for 3 to 5 weeks followed by a period of physical therapy and a gradual return to weight bearing which requires an additional 2 to 3 weeks, making the period of total disability between 5 and 8 weeks. Simple strapping and the use of metatarsal pads have been tried, but the results are disappointing. Longitudinal metal bars and transverse Thomas bars applied to the shoe have also been used with slightly better results. Some have advocated bed rest in recent months but as yet no report on the results of such treatment has been published.

Our routine entails the principle of bed rest for a period of about 5 days and the administration of desiccated thyroid (U.S.P.) 1 grain three times daily. The patients are given bathroom (bed) privileges and they are furnished crutches for this purpose. The amount of bed rest required where the fracture is complete will run up to 9 days. An examination is conducted daily with particular respect to the soft tissues, swelling, and it has been noted that the swelling will disappear gradually in 2 to 5 days, although the foot will appear swollen for many weeks due to the presence of periosteal callus at the fracture site. It is important that no differentiation between these two (inflammatory and reparative) types of swelling can be done very easily by what our patients have come to call the pinch test (Fig. 5). By pinching the skin (or the second or third metatarsal head) between the thumb and index



Fig. 5. Pinch test. The normal foot (left) is easily pinched, while the foot with a march fracture (right) is not. The thickened skin of the affected foot is shown in the right image.

finger on both the normal and affected feet, a thickening or turgidity in the subcutaneous tissue will be noted if inflammatory edema is present. In most cases this test will become negative at the end of the third, fourth, or fifth day. Bed rest is continued for 2 days after the pinch test is negative. The patient is then allowed up and returned to full duty with a supply of thyroid tablets sufficient to last a total of 19 days. No other treatment is given such as strapping, shoe corrections, or physiotherapy.

RESULTS

In general the results obtained by this method have been exceptionally good as shown in Table II. The immediate results are 90 per cent good in that practically all the cases are symptom free at the conclusion of the hospital stay; they are able to walk without pain or limp and the pinch test is negative.

The intermediate results were recorded by periodic examinations throughout the first 2 weeks of duty. During this time no relapses or failures were encountered, although minor complaints were made by approximately one half of the men. These symptoms were plus minus in character; for example, it doesn't bother me unless I double time too much, or it hurts a little in the morning when I first get up, or it felt funny the first few days after I left the hospital, but not enough to keep me from duty. These were typical comments in the patients.

TABLE II—RESULTS OBTAINED IN THE TREATMENT OF 58 CASES OF MARCH FRACTURE BY BED REST WITH AND WITHOUT THYROID MEDICATION

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	S y	7											
	I	5											
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	N b d	6	5										
Thes	b i h m	m las	d d b	f l d	b as	ce as	l pa	d b i	f h	m	ary	b f f	h

own words and indicate that the foot is not perfect after the period of bed rest but in the absence of any objective signs is capable of withstanding ordinary line of duty. Any extremes of exertion are likely to remind the patient of his recent injury. The intermediate results indicate the beneficial effect of the thyroid medication for in those who received thyroid there were no complaints in 63 per cent while among those not receiving thyroid only 41 per cent were symptom free. This difference tends to corroborate our view that the systemic factor may be hypothyroidism.

The final results were uniform irrespective of all the available factors i.e. the use of thyroid and the stage of the lesion on admission on made no apparent difference in the outcome. On the basis of excellent and fair results out of the 6 complete fractures we may look to this group as the most unique team.

SUMMARY

1 Fifty-eight cases of march fracture are presented of which 48 were studied from the standpoint of basal metabolic rate. The average rate as minus 10.72 per cent. The average pulse rate was 62 and 57 per cent of the men were either tall or fat.

Bed rest for a period of 5 days and (in 4 cases) the administration of desiccated thyroid (1 grain three times a day) for a total of 19 days was the routine treatment followed.

3 A test described by hisser as to differentiate inflammatory from periosteal swelling. The test is a guide in letting the patients up.

4 Mild nondisabling symptoms were complained of in half of the patients thus treated (these symptoms lasted from 1 to 14 days).

5 Those who received thyroid showed better intermediate results than those who were treated by bed rest alone.

6 The final results were excellent except for that group having complete fractures.

CONCLUSIONS

It is probable that a mild hypothyroid state may be a predisposing systemic cause; patients who develop march fractures. Cast treatment not necessary, nor is it indicated except possibly in those cases in which the fracture line is complete. Bed rest continued through the period in which the inflammatory swelling disappears and continued for 3 days the earliest is the treatment of choice. The administration of thyroid best suited for a short period is apparently helpful.

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FLUORESCCEIN—ITS USE IN DETERMINING THE VIABILITY OF STRANGULATED INTESTINE

C ALEXANDER HATFIELD MD ROBERT A BUYERS MD d
ADOLPH A WALKLING MD FACS Phil d lph P 351 12

IT may be stated that the diagnosis of viability of strangulated intestine has not been an exact science. As Wainstein noted in borderline cases it is difficult to be certain by any method. Owens and Smith stated in reference to determining the safe point of resection. The more experiments we did the harder we felt this point was to determine with any degree of exactness. The potential viability of strangulated bowel has for the most part been estimated purely on a clinical impression based on return of color pulsation of blood vessels presence of peristalsis and other signs found reliable by the individual operator.

Failure to diagnose properly damaged intestine carries a high mortality. The death rate in suspected strangulation with subsequent resection of doubtful bowel is three times as great as in those cases that escape resection (1). Until recent times no one has been able to remove the doubt in doubtful cases while the obvious ones need little comment.

The use of fluorescein is a relatively new diagnostic aid that appears to be accurate and simple. Herrin Glasser and Lane reported as recently as 1942 the clinical use of fluorescein among other diagnostic aids in 4 cases of hernia and 1 of strangulated omentum. We wish to present 5 cases in which fluorescein was used at the Pennsylvania Hospital with satisfactory results. Its use clinched the diagnosis as well as furnished considerable information. It is a worthwhile method of determining whether or not bowel is still viable. If there is a reasonable doubt about the viability of a segment of bowel whose removal would jeopardize a patient's life the fluorescein method of evaluation is simple safe and accurate.

Fluorescein a form of esorcinophthalen is extremely diffusible (3). It also absorbs ultraviolet rays of long wave lengths. When these rays of 3660 Angstrom units strike fluorescein they are instantly converted into the longer light waves of the visible spectrum. In 1931 Lane

and Wolheim (4) showed that this fluorescence could be demonstrated in living tissue. All that is necessary is a small amount of fluorescein in the circulation medium and the tissues glow when exposed to ultraviolet light filtered with a Wood's type of filter. Chemically the dye appears inert in mammalian circulation. Pharmacologically except for an unidentified interference with the activity of novocain and pontocaine the dye is inactive and is effected unchanged by the kidney 99 per cent in 30 hours (1). The percentage of dye in use is a 5 per cent suspension of fluorescein in 5 per cent sodium bicarbonate solution having a pH of 5.7. The dose is 20 cubic centimeters (1 gm) of this suspension intravenously. We have observed no untoward reaction in over 50 cases.

Depending on the circulation time the subject will be seen partly to fluoresce (90 seconds) by the time the eyes are accommodated. The degree of fluorescence depends on the type of tissue and amount of pigment present. The skin shows up quite well in normal white persons poorly in the colored race. The mucous membranes and serous surfaces in both races show up equally well.

Inspection of the serosa of normal bowel exposed to filtered ultraviolet light when fluorescein has not been injected revealed coloring that is uniform. The intestine is dark purple with a smooth velvety consistency. In marked contrast the presence of fluorescein in the bowel makes the serous surfaces under the filtered ultraviolet light glow greenish gold with release of visible light that will evenly illuminate structures immediately adjacent. Bowel that has been temporarily or permanently deprived of its blood supply appears when exposed to this light an even deep velvety purple. The contrast between this deep hue of area and the brilliantly glowing greenish gold bowel is dramatic and colorful. Similarly when circulation returns and viability is restored the gradual conversion of the dark purple color of the doubtful areas to a glowing golden state is unmistakable and astonishing.

On the basis of Lane and Boyd's work which showed that fluorescence readily occurs where

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viability is present (3) and that it fails to occur when irreversible change has taken place. Fluorescein was used in 5 cases. Each one presented a loop of small bowel so involved as to have a doubtful reversibility state.

CASE REPORTS

C. H. R. h t m l 57 y s f g was dm t t d t h S r g c a l S c A f t h e P s y l a H o s p t l J r y 4 944 T w d y s p r i t d u a h w h h h a d h d f y d c d d t t h e t m n d h a s u b l t d e t S c t h t t m h h d m t d t c d d t r t u m e s t h d y f d m H t t d t h t h b d m h d b e e p f f d p w t h t e r n f p a s f d y s T h w b l m d t f 3 d y s P h y s l m t l d d b l t d t g u n a l b r n t h g h t d h b w q t t d N p e t a l u c d h d h d t h f m s c t a l m a s T h l y n g k d d d m t T h b d m was l i g h t y d i d d t h f w h g h p e t h e t u l

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A t p e t s a w s f d d P p t l u g m t h c h t a d t m e t r s f d k d h w l F l e s c w a s j e c t d t o l y N f s c e d i n t h l o o p f b w l t o s t h t f w m t f l s c e w a s t p a d g r d l y t h t d o u b t f u l T h l p w t r n d t h p t l c a v i t y a n d t h b r n w p a i d T h p o t p u d i a g n o s a s c a t d f m t h r m

A f t e r p e r a t u p t t g l c d t l l t A m a l l h e m t m d l p e d t h d b t t e s o l d t s e l f g r d l y

C s 3 M K w h i t g l 43 y r s f g w a s d m t t e d t o t h L y i g D v i f t h P y l a m H o s p t a l A g u s t 9 t h 944 w t h h i s t r y f c o l l k y p u n a n d t h m b l T h m o s t c t t a c k f p o c c u r r e d d y s b e f a d m s s d a s m p a n d b y n a u s e a n d m t u g T h f l f t h p a s P h y s i c a l x a m n a t e a l e d a n t m l y l l p t u t w t h t m p e t r e f 3 d g e e s T h b d m w a s s l i g h t l y d i s t d e d w i t h g l i z e d t d r n e s p e s e t P r i s t a l s w a s h y p o t u A m a s s w a s p l a s t e d i n t h g h t p p e r q a d r a t d t h r i g h t d n a l g u T h p e r a t u d i g n o s w t w t e d n a n y s t A p r e p e r a t u l a r g e t s s c p e t a s f d d r e d c o d T h d m g e d b o w l h b w t r n a l i d u m

t h p o l y p b o t 6 c e t m t r s f m t h l o c a l l w a s t m p r p l d f i l l d w t h f d A f o u l o d w a s p e s e t E x p o t W o o d l m p f t f l e s c e j e c t e d t h l y h d f l e s c e c e f t m t e s f p p r t u t m t T h b o l w s r s c t e d d p a r e d h y d t s d t m f t h f i t 48 h r s f t p u t m i a w d t d t h p t t p g r e s w r y t r m y S h p o d g r d l l y d i s c h a r g e d n a t h 4 t h p t p e r a t u d y T h p t h l g a l p t t t h t h g m n o f i l m m d h w d g g r w t h g g s p l y p c a g i n t s c r i p t s

C 4 J S w h i t m l 6 y f g w a s a d m t t d t S g e a l S v A f t h l y l a m l l p t l N m b e 6 944 T h p t t g e p t h y f h f y T h h t s o t d w t h p t l 4 m t h g A t t h t m t h b l m d d d t t h s c t m d c l d t b d e d d i l y b y t h p t t H p h y d d t h d t u d t h m p p t l t h d y f h p a l d m s s F h p t t t h e t u n t h p t t w s e c u t t h b p t l h c p l d f g r t p t h s c r i t m H l s o m e t d T h p a u n w a s d s c r i b e d a s c o t d l t u g h a c t e

A t p h y s c a l x a m t t h b r m l f i d g e c t d f l a g t d m a s s t h g h t s c r i t m P r t l t h b d m w a s f l y t T h w s o m t d r n t h r i g h t l w q d r a t f t h b d m T h e p p u t d i a g n o s t g u l t d d c t i e u l h m a s

T h p t t w a s p e r a t d 3 h r s f t a d m a s T h h r n u w e d c e d d t h i n l d b o l p e d t b e d k r p l d m t u s d t a d s o m t h m b o s e d b l o o d e s s e l D m g h O g r m f f l e s c w a s j e c t e d l y E p o f t h b o l t W o o d f i l t d i d t t f t f l e s c e H w m t f i d l y v i b l l t h g h t d t t h a t p p e g m b o w l W t h d i a g n o f b l b o l t h l o o p t d e t t h b d m d t h h n h p h y m p l t d T h e p o t u r s e w a s e v t f l d p t t d c h a g e d 4 t h d y

C a s 5 R P l e d m 4 y f g w a s f r e e d f m t h M t t y d p t m t f t h l y l n H p a l d m b e 944 t S g l S A b e c f l u k y p t l d m e d m t g S h b d h d g d t u d c u p t T h p t t g h t y o f h g h d h n t h l i t g r h h h d d e d t l f p t a l y d y s p u s l y

A t p h y c a l m t t h b d m w f l t o b d t d e d d r y l t l p r i a l w h d M k d g l a z d e n d r e s p e t e s p e l l y t h l f t l q d r t f t h b d m h m a s s w p l p b l T h p u t p r n d m k e d p h t h l f t g u n a l g w p l o p t e d P l x a m t l d l g f i r m m a s s t h c u l d s a

A f t t h b d m l l w p e d t h p o s t n t s h t a n d p e r t m w f d t b e q u i t t h k d d e d m t B l o o d y f i d d l o o p f t u b o w l p r e s e t d t h p e t e u m T h l e s l u l f t h t r m n a l i d m w t h t b a s e t t h p e g f t h h m a l s a c F l e s c e t d y h d b s o l i l y b u l t y p p r o x i m t l y 6 c h e s f b o l f t m t f p p o t u t r e a t m t T h m p m i s s e d b l a s e s e c t e d d a d t o s i d a n a t o m o s w d

A f t p e r a t u t h w a s m l l r n t m p e t d p l s e t h d d 4 t h p o s t p e r a t d y T h h r n u w a s p a u r e d t h 4 t h d a y a f t t h e s e t u f d m g e d i l m M c r o s c o p c a l l y l l s e c t i n s h w d m k d h m

STRUMA LYMPHOMATOSA STRUMA FIBROSA AND THYROIDITIS

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THE large proportion of cases reported under the general heading of chronic thyroiditis are of a nonspecific or unknown etiology. In the various subgroups of nonspecific chronic thyroiditis namely struma lymphomatosa (Hashimoto) struma fibrosa (Riedel) and the pseudogiant cell type or struma granulomatosa (De Quervain) there are no single pathognomonic or distinguishing features. The result has been a marked confusion in the literature where names have been used loosely without precise clinical and pathological description. It is our opinion that struma lymphomatosa is a clinicopathologic entity. Struma fibrosa and its pseudogiant cell variant are different manifestations of the thyroid's response to inflammation. These two groups are considered separately only to emphasize their essential similarities and relationships.

The general subject was touched upon during the Eighteenth Century with descriptions of suppurative and nonsuppurative thyroiditis (10). Later there were distinctions drawn between inflammation of a normal thyroid and a goitrous thyroid. In 1878 Kocher claimed that all inflammation of the thyroid was of a metastatic origin. In 1884 Bowlby at the Pathological Society of London presented a case of infiltrating fibroma of the thyroid concluding that it was of a malignant and sarcomatous character. De Quervain (3) in 1904 stated that nonpurulent thyroiditis was a disease sui generis with definite clinical and pathological characteristics. Riedel (5, 53) in 1896, 1897 and 1910 described the extreme fibrosis and adjacent adhesions of the thyroid gland under the heading of *Eisenhartes Strumitis*. Hashimoto (11) in 1912 described a diffuse enlargement of the thyroid gland by lymphocytic infiltration and lymphocytic hyperplasia with accurate clinical and pathological descriptions. This he considered an entity and not related to Riedel's *Eisenhartes Strumitis*. Dr. Ewing in 1922 believed that lymphoid infiltration and hyperplasia and fibrosis of the thyroid were the early and the late states of the same disease process which he designated as benign granuloma of the thyroid. Without reference

to Ewing's opinion Williamson and Pearce (6) first in 1925 described a lymphadenoid goiter similar to the descriptions of Hashimoto. Graham and McMullagh (5) in 1931 in a complete review of the literature with additions of cases of their own separated the diseases as described by Hashimoto and Riedel into clinicopathological groups. This cast a shadow on Ewing's widely accepted opinion of 1922 and 1928.

During the next decade there was a great deal of confusion in the literature with supporters for and against the unitarian concept of etiology as expressed by Ewing. However the excellent reviews of Clute *et al* (7) in 1935 and McClintock and Wright in 1937, Joll in 1939, Harris in 1940 and McSwain and Moore in 1943 to ether with numerous authors reporting cases now support the balance heavily for clinical and pathological distinction between struma lymphomatosa and struma fibrosa.

At present many cases reported as struma fibrosa are confused with the more acute and granulomatous form of chronic thyroiditis so beautifully described by De Quervain and Gordanengo (14) in 1936. They reported 8 cases of subacute and chronic thyroiditis of a nonspecific etiology. They traced the various stages of acute to subacute to chronic thyroiditis. The latter is characterized by many cellular aggregates resembling foreign body cells, acute and chronic inflammatory cell infiltration, acinar degeneration and obliteration with marked fibrosis. This confusion is justifiable as struma fibrosa seems to be a late state of the earlier more acute forms which may resolve or may be progressive in their pathological changes.

CASE REPORTS

Struma Lymphomatosa

C	No 9994	A W	3 ye	ld	whit f m	l h
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f h g	t	4 years	P	th	l r y	eal diphth n
p m m	t	allect	my	saphea	l g t	3 lf
d ed	boru	d	rm	l f l l	rm p gn	cy
Th	w re	astent	disea	es	L bo	t r y t
h	lut	blood	t t	be	8 65	b sal m
pe	t	Wasserm	nn	g t u	Phys cal	xam u

From the Department of Surgery, the Rochester University School of Medicine and Dentistry.

caled s w l l d l ped d nshed femal Tempera
t re p lse and resp rations w re orm l Blood press re
w /7 Th thyro d was firm d diffusely enlarged
t t d with trach al t g wall w g Th re was
od le th right l be

At perati n right bt tall bect my w perf rmed
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firm tough d cell la mea ring 3 by by r ce tum t r
Microscop callly th re was rease in fibro tiss d
m sked l bulati f th gla d There was canardege ra
t n with l w flat cubo d l eph th h m htl coll d
d nsal size of c The was diff e infiltrate w th
lymphocytes d um n lymph f lides with germinal
t r s Post pe t rse was thuk At f flow p
g weeks aft operati f rth !gement f l f eck
was ted B sal m t bolic rat t that tum w — 6 pe
t d th re w re ly gus l myzed m Shooting
pai m h f rehead w re ted

The pati t was re dm tted April 9 1939 beca se f
tightness bo t eck dy phagi d h ka At th tum
m led diffuse l rg m t f the f l f l be d isthmus
f th tr d as ted Basal m taboli rate was — 3 pe
t ch leste l 6 milligram pe t

At f t bt tall be t may ealed firm fib owed l be
which rl th tr h t n ly with t dhen ns
Grossly the cased t a w to h d fibrou The micro-
scop p tur was lm t d tical th the first secti
mo this pre ly except that th lymph f lides with
g rnaal ce r w re mor disect th w les gen ral
lymphocytes infiltrate d mod rat creas co
ect tiss Post perati co nlese ce was un tful
th m led reli f f bstru ti e ympt ms Myxedem
was t lled by 60 to 90 milligram f thyro d str t
rally each d y be ye as t adm 300 mil
l or m f thyro d str t cessary ch d y Oth
w in good h lth

CASE 2 \ 332 S \ E 7 yea l d whit f m l e
h used w first dm tted th St g M m n l l s p
talm l reh 938 H rchi f complaint was f u hness in
h k and dy ph m f al w ly p oress tar f 5
ye r d rat f Years pre ly t th h p tal
h had h d larged isthmus f b thyro d rem ed
with th path f mcal d mos of bro thyro d u d
cell l hyperpla Luf tun t ly th r microscop c sec
ti s destroyed Past history was egati Sh had
h d m l p egancy Laborat ry tests h wed ber
whit blood co t t be 7 co Wasserman egative n
b sal m tabol rat take Phy cal xaminati re ealed
l l d l ped and unshed f mal T mperature puoe
resp rati ns re m l Blood pressure w 7
Fundi g w re erat ept f r hard diff se enlarge-
m t f both l bes f th thyro d more ma ked the
n ht

At perati b l t ral s bt tal thyro dectomy was pe
f rmed Th nly dhen a ted w re t th ut f th l d
midline sca Grossly the gland was tw t three tumes
rual size firm grayish yellow w th ltl bleedm
Microscop exams ast e ealed diffuse lymphocyti
infiltrate w with num rous lymph f lles with germinal
ters There was ly slight increase in fib oses t
Th re w marked cuns tr phy a d th collo d was ry
scanty Post perati e co re was an tful

At f flow p 4 1/2 years late ur t ral t was rem ed
ed transparent rally t and a half years lat basal meta
bo rat was +4 thou h ympt ms and signs f mild
myxedema w re ted wh h w co trolled on 3 mill
grams f thyro d rally a d y

Patients in Cases 1 and were operated on
twice In Case 1 the microscopic sections

months apart are almost identical and are re-
prod uced here In Case 2 the microscop c secti ns
of the first operation 5 years previously at another
hospital were unfortunately lost The microscop c
diagnosis at that time of chronic thyroiditis and
cellular hyperplasia however infers that little if
any change occurred in this gland during the 5
year interval These cases may be added to those
of Perman and Wahlgren Roulet Clute *et al* (7)
McClintock and Writ h f l l Hellw and Heyd
Each of these authors reported a case in which no
essential microscop pic chan e from the original
p cture had occur d over periods up to 9 years
Heyd stated that h s original microscopic secti n
revealed struma lymphomatosa and the sec nd
operation revealed struma fibrosa thus c nfirm n
Ewn s beliefs However on review of his ma
terial the e seems little q estion that the first
operati on on the patient revealed a struma fibrosa
and that there was actually no transition except
in degree of fibrosis and adhesi ns

CASE 3 \ 60460 E A whit f m l h d w
dm tted f th th d tum t th St g M m l Hosp
tal J 943 l l h f repl t t f p ess
eck grad l easi g fullnes f eck t noly d
dyp e f y ars d rat n Sh had be f l l d y
by h pri t phys bel dm f g ry d r
ing which tum th ympt m w l y p gres p t
h tory aled t be cul d mus y rs p ly
T maa f p regna cy occur d 4 3 ars p t dm
with t rminati n l p gna cy by esa t d
byst ect my

Laborat ry xam ti h d ht blood t t be
8 400 basal m tabol rat — 8 pe t Wasserman
egati Phys l min tu r l d m l m pe
ture puls d resp rati n blood press f /70 d
w egati pt f firm d f l g m t f th
thyro d gla d tw t th t mes m l i z

At perati n b l t ral bt tal thyro d t my w pe
f rmed Grossly th tis used w s homly firm d
fin ly l bulated Microscop xam ti h d diffuse
lymphocyti infiltrate with m lymph l l l th
g rnaal ce t r light cr a e connecti e t
m led acina d ge erat n w th sca tv l l d lost pera
u co rse was un t l At f l w p 4 m th lte
perati basal m taboli rat w — 7 pe t th
gus d ymptom f ealy myzed m l p ese t D
rembe 943 h co t l l he ympt m th 3 t 60
mill-grams f thyro d tract rally ea h d y d is
therwise l l ent h lth sb h ted th less thyro t
extract is necessary now than immediat ly afte perati
t co r l sign d ymptom f myzed m

CASE 4 \ 6 L S 5 yea l d whit m l was
first dm tted t th St g M m n l l Hospital J uary
94 Th chief complaint w lump eck d hoarse
ess f 7 m th d ratu H lso t d pa esthes as f
extremities H was m tted th ra k: diti
pseud xanth m lastu tum and had th associat g d
treaks f th reumas w th p ogress ly ladi gory on P t
hust ry w esse tally egati Fam ly h tvi re ealed
siste with a similar skin lesi n

On physical xaminati mper tur pulse and resp ra
ti re rmal blood pressure was 60 8 Ther w
loss f lasticity f th skin f th ppe trunk and eck

d t was th k ed Th w a diffus nla g m t f
 h thyr d most p us t th m du
 At peratu c m f nla ged thm ly was r d
 t b t dhes w t d G ssly th c d tu
 bas m th firm t gh w th yell vish cast M or scop
 aminatu al d diff flt t n with lympho
 phyes d um us lymph f l h l with g rm nalc c rs
 Th re w mod t in t tis p
 acula ly t i bul septa Th as lm t mpl t
 bs nc f ca p th hum The w plasm ll
 Th w re ra tra cin llul gregg t ns m
 bl g f re n body gna t lls P t pe t rs w
 tful P t t d 800 f d p ray t night
 and l f t n r v l g At f ll w p b sal m ta
 bol rat h rly ft pe t -33 pe ent Th
 thyr d gla d m l t d w y in iz f ll g y d
 m th l t th ck h d d r e d h r ur m
 f re Th p t t d l ped mld g d ympt ms f
 myzed m d was t l l d n 6 t go mll r m f
 thyr d tra t lly h d y At thum h w la t
 see h was lmost bh d f m p gr f th t l
 des in both ye H d d t th t H p t l
 94 d th p rt y t alab l

Case 4 is a male with struma lymphomatosa and one of the few ever to be reported. He is also interesting in that he had one of the rare skin lesions pseudoxanthoma elasticum coincidental with. This man exhibited all the clinical and pathological characteristics of struma lymphomatosa including an excellent response to x-ray. He developed marked myxedema even though only the enlarged isthmus of his thyroid was removed. Graham (26) in 1931 reported 2 males. Joll reported 3 males and Kearns reported 1 case of a male with struma lymphomatosa.

CASE 5 N 94097 CS 83; Id whit f m l h se
 wif as dm tted f th d tim t th St g
 Mem sal H p tal N m 935 H h f mplant
 was f mod t diff la g m t f th thyr d f 7
 years and p dgr wth f th l t m th w th p and
 t d m ss th l f t Th b m h d as so t d
 dysp d dysphagi B sal m tab h rat y bef
 entry had bee - pe t Past hit ry was g t
 ptf mld d p es l psych yea pri t d
 mss Sh had h d m l pregn c coex t t
 dise es

Laboratory aminatu b d b sal m t boli rat f
 -9 pe t W ss rm n eact w g t Phys cal
 xamin t l d r m alt imperat p ls d p
 ratu ss bl od p es ur /80 Th thyr d was diff sely
 n l rged dm th thm It was b d and t d
 At ope t bul t al btotat thyr d ct my was pe
 f med w th rat m ked difficulty beca i dhes
 to th ftt es f th ck G ssly th gl d w fin ly
 nod l to gh, firm t hard
 M cr se p xamin t led mod t t ma k d
 creas tib tuss Th re w lmost coupl t acna
 d g ratu w th l t l l d M y cm h d
 co less dnt pal f amy type f ll w th t es mbl
 to foreign body gna t lls Th re was diff infiltrat
 lymphocytes th m lymph f l lles th g rm
 lce ters Th re w mod rat amb f plasm lls
 A rare pseud g t cell w a cen P tope t course w
 un t l f l flow p xamin t n basal m taboli rat
 36 m ths lat was -3 pe t Three d half
 m ths aft peration thyr d graft m an th p t t

d g g thyr dectomy m pl t d d tly th
 f m l j th l f t gr be th th moul nalg
 m t Th gh ppa tly th graft w bl t mpo rily
 t was m pl t ly un ess l d t 4 3/4 m ths th
 w unnu tak bl signs f myx d m and th b l m t
 bl rat w -35 p t Th p t t b s b f ll wed
 sa f 9 y rs with b sal m taboli t g f g m
 -3 t -4 pe c t Th blood h lest l t tum
 300 m ll gr m p t E ptf t m p l
 ympt m w th g f 37 y rs th p t f l w ll
 d t N d d t oom ll grams f thyr d tra t
 h d y ll k is soft n t d d th pes
 ur ympt m

Case 5 is an enigma. She presents characteristics that make difficult her classification. Good evidence for struma lymphomatosa is her past history of diffuse enlargement of her thyroid with a low basal metabolic rate, the gross appearance of the preserved specimen, the microscopic appearance of the gland, her postoperative course of myxedema and her early menopause. One suspects the diagnosis of struma fibrosa because of her age, recent acute history superimposed on a chronic enlargement, rather marked pressure symptoms, adhesions of the thyroid at operation and rather marked fibrosis of the gland. This may be explained by a subacute nonspecific inflammatory reaction superimposed on an already existing struma lymphomatosa. With regard to Case 5 it should be noted that there was an unsuccessful attempt at a homologous type of thyroid graft in an effort to control her progressive postoperative myxedema.

CASE 6 N 40044 MW 5y Id hit school g l
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 Hospital Sept mb 944 H h f mplant w d f
 f n l g m t f th thye d f se 1 years with as o
 c t d t b rs es lght dysph ga d dysp
 Sh bo t doc lly h rrp b night k th t
 rad ted t h night G wth f h g d h d be
 rap d 3 m ths bef try H b l m t b h rat h d
 be und -5 pe t f th 6 y period pri t d
 uns T h l t l d t m t u n s w 8 d 06
 mll gram pe t Tw y rs bef adm h had
 d porad ally l t t l pota m odd d thyr d
 tra t by m th H p t h t ry eal d ns llt 6
 y rs bef re prese t dm t which tum diffusely
 l rged g t f mod t iz was t d Oth adm
 w f t snall t my t u media d bd m l
 pain At th ltt adm ss th thyr d w some ab t
 tend to p lpatu d th q estu f cut thyr d t
 h d be raised

Laboratory xamin t bow d ch l t l 8 m lli
 grams pe t b sal m taboli t -9 pe t Wasse
 man act as egatu Phys cal xamin t
 l d mod rat ly bese g l blood p ess /7
 t mpe t pulse a d respirat m l th rwise
 g t ptf diffus ly nla g d firm gl d with t
 fixatu Th gl d was bo t th times m l
 At peratu h psy f isthmus ly was d N adh
 w re t d Th tuss was gros ly firm w th y l
 lowish ast cut urfac Microsc p exam in tion bowed
 mod rat infiltrat n f lymphocytes th gh t h
 trom am g th cm w th um lymph f l lles and



Fig 1. Struma lymphomatosa. (G. & C. H. 1. 1.)

Case 9 would certainly be considered by many as a late case of struma fibrosa. Yet her relatively short acute history and the microscopic findings suggest a pseudogiant cell type of chronic thyroiditis. Five years later the right neck, the site



Fig 2. Struma lymphomatosa. (G. & C. H. 1. 1.)

of the original involvement was still hard indurated and nontender. The condition is more typical of Riedel's struma. This fact is strong evidence that struma fibrosa is really a late stage of progressive fibrosis of a chronic thyroiditis.

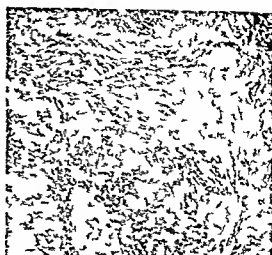
Fig 3. Struma fibrosa. (G. & C. H. 1. 1.)



Fig 4. Struma lymphomatosa. (G. & C. H. 1. 1.)



Fig 5. Struma lymphomatosa. (G. & C. H. 1. 1.)



beefy t y p l y l l h g y d q t f m
 M cr sc p m t h d m k d
 fib t r r g d h l und p th l
 th t h d g n f m l e d l g t d had o-
 l sc d t m l l l g g t y f th l t
 tru f g n body l l Th p y f th l l
 M l l m y be th p t g th l l
 m som I th pp t f t f d
 g n body g u a t l l Th y lymph y t d
 p m l l I th d m t t f
 p l y m ph l l f m m t f l b
 Th p t th t f t d h f l m t
 Post f t rs t f l P mpt l f f
 y mpt m b t d
 At f l l p m t 3 m th ft p t th
 p t t t l l y y mpt m f Sh h h d m
 g n l g l d f l t th th q t f p
 l f b s a l m t a l t 6 m th g -8 p t t
 w h b t m h w t k g f th y r d d y Th
 d d t / g d y i h d l p d m l d
 y mpt m f m y z d m d th d s a g
 d t g d y At p t 3 m th ft
 p t h b l m t b l y m t -5 p t H
 k soft th g h t Sh h y m t i d y ph
 dysp



F C 7 A 36 A K St um fib Th
 h d h l e d h t f th fib t h
 Thy d p th l m l t l y r m l

CASE STUDY

The clinical charts and microscopic sections of all the cases in which a clinical and surgical review was never the clinical or pathological diagnoses of acute subacute or chronic thyroiditis fibrosis lymphoid or cellular infiltration or granulomatous change of the thyroid were mentioned stated or suggested. This study covered a period of 17 years during which time there were 3750 admissions for thyroid disease. The protocol and microscopic sections of 8000 postmortem examinations during this period were also studied in a similar fashion. The cases presented have all been

Cases 10 and 11 are excellent examples of the pseudo giant cell type of chronic thyroiditis described by De Quervain (13, 4). The latter case is more acute than Case 10. At a casual glance at the microscopic sections the arrangement of the fibrous tissue of these cases and Cases 4 and 5 seems similar. Yet the two processes are entirely dissimilar in that Cases 10 and 11 are the early stages of an acute to chronic inflammatory process. Cases 4 and 5 the end stage of a chronic degenerative process. The fibrous tissue in struma lymphomatosa is of a finer avian nature than that of struma fibrosa or its earlier more acute form in which it is hard staight and often hyalined.



F g b Ph t g ph l f h
 d l h g l h t g h h
 h d h t fib l l t h

l m t f sor h gu d p f
 l m t f t h l th pha th
 f l t f t m fib

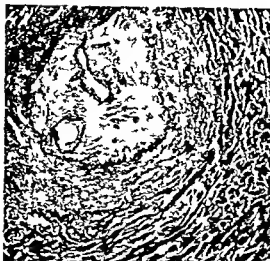


Fig 8 Case 8 N 303 Vh Strum fib osa M ked
fib osa f h d hral ed h rat P rt n la
fib osa d t m l th ck h wn A mod rat
mbe f leucocytes d lymphocytes fib pla es
A occa nal pse dom ll aa ted Acini f ly
rm l pp ran

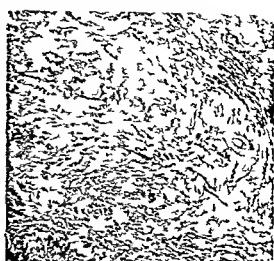


Fig 9 Case 9 N 349 Vh Strum fib osa g t ll
t M ked ease fib t rr ged
h l th reas f mod t hyalini tu Mod rat
mbers f l oocytes d lymphocytes fibro pla es
Mod rat pe t l fib on m d g l
th p th f m rm l lse h f ed es

seen personally at recall except 2. In Cases 4 and 5, the patients are dead.

After operation and postmortem examination in many cases diagnoses of chronic thyroiditis or fibrosis of the thyroid were made because of a

slight increase in fibrous tissue of the gland or an increase in round cell throughout the stroma. There was no clinical or gross pathological collaboration of the endonoses. The microscopic pictures were probably representative of the varia-

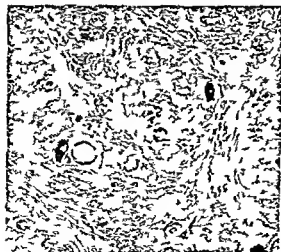


Fig 10 Case 9 N 349 CZ Struma fib osa g t
cell area t M ked increase in fib tis. tran ed in
h l f mod ra h dyes d hyalinizati Diff se
find focal infiltrations f leucocytes and lymphocytes
Man deg rat cnu w th rmati f tru and pseudo-
gian cells



Fig 11 Case 9 N 349 LF Strum fib osa gart
ll nant M ked ease fib t rr ged
wh l f mod ra h d ess d hyalini zat Diff se
infiltrati f l oocytes d lymphocytes fib us pla es
Few focal bases-es Deg rat ac f narte vol fibro-
sis d t m l th k nin m pse fous t ll



Fig. 46. 34. 1 K. Foc. l. trum. lymph. m. t. post. m. t. D. th. ed. dde. ly. t. g. f. 43. by. b. l. h. m. h. g. N. y. pt. f. bl. t. thy. d. id. d. M. sc. p. p. t. d. t. gu. h. bl. f. tru. t. m. ly. ph. m. t. sa.



Fig. 3. A373. F. H. Tru. myx. d. m. po. tr. t. m. M. l. d. c. f. fib. t. f. d. ff. f. ly. g. h. t. C. m. pl. t. d. g. t. w. th. les. c. i. m. ll. ll. m. Mode. t. d. ff. se. ly. ph. d. filtra. to. th. type. pl.

tion from normal with increasing age. Attention here should be called to the study of Loeb and Simpson in 1938 on guinea pigs. They noted from birth a gradual increase in fibrous tissue in amount and density. This was most marked about the arterioles and least around the lymphatics of the thyroid. Anterior pituitary hormone stimulation was capable of loosening the stroma.

It is of interest that microscopic sections of the thyroid in 4 cases not reported here showed a case identical with a true struma lymphomatosa. The sections were obtained at postmortem examination of an entirely unrelated disease. These cases are similar to those reported by Jaffe in 1938 and by Simmonds (58) in 1937. They also represent the error that can arise if one judges the cases by microscopic section only.

This small series was selected after reviewing and excluding the following groups of cases: (1) acute subacute and chronic thyroiditis of known specific etiology; (2) round cell infiltration of moderate fibrosis of thyroid gland without enlargement, asymptomatic and usually associated with intercurrent diseases, old age and debility; (3) focal round cell infiltration of thyroid gland with lymphoid hyperplasia associated with simple colloid nodules, adenomas or toxic thyroiditis.

An attempt has been made to distinguish between a strumitis and thyroiditis. The former is inflammation of the parenchyma of the gland. The latter is inflammation of a normal thyroid gland. Inflammation of the latter is the nor-

mal and pathological can be differentiated easily. In a wide intermediate group, however, it is impossible to say whether inflammation precedes or succeeds pathological change in the thyroid. Thus confusion is avoided in the search for etiological agents or conditions.

Individual features that deserved emphasis in this small series of cases presented are discussed at the end of each protocol.

CLINICAL CHARACTERISTICS

This series is too small to draw any conclusions with regard to a specific clinical summary. However, when they are added to their respective groups reported in the literature they conform to the clinical peculiarities of the disease group in question. In Table I the clinical characteristics of these groups are briefly summarized.

For acute thyroiditis occurs most frequently in young adults. The pseudotumor cell type of chronic thyroiditis and struma fibrosa occur in the third and fourth decades of life most frequently. Struma lymphomatosa occurs most frequently in the fourth and fifth decades, though there is such a wide range and overlapping that age alone is not a valid distinguishing feature in any of the groups.

Seventy-five per cent of the 3750 patients admitted to the Struma Memorial Hospital for thyroid disease were females. Thus the ratio of female to male in thyroid disease is roughly 6 to 1. The ratio of female to male in struma fibrosa is state-

TABLE I—CLINICAL CHARACTERISTICS

	rum l m h m oia	fibrosa	ru fib ma-e	ll
Age—rs	0-60	20-	0-	
Sex—fe f m l	Am 30	no-00	no-50	
Pre l m na m m	P ese f m	re su re p	re su re p	re su re p
D ra f sym ma	U ual	rs w h ace	tel ra	years
Present l go	U ual	rs	m h	
D ra l go	U ual	rs	m h	
Degree f h ro l	Al d d se	er nil ral	er l l	
Response ra	Ex l	N	U k	
For pe	U f l	Of em	U ual	f l
F ll	U ed m d rs	d ge ral m hol d	N m f m f f w m a	U ual recu re

a rou hl 3 to or 4 to 1. In struma lymphoma tosa almo t 100 per cent f the patients are females. The few e ceptions ha e been noted previously n this paper. Therefore all male with the diagno of trum lymphomat sa ma be regarded with uspic on unless the entire cl uco-patholo ical picture is presented.

P to it u s ptoms Symptom are varied and ften overlap but in eneral the presentin symptom in struma l mph matosa i diffuse enlar ement of the thyrod. Occasionally mild pres sure symptoms a e noted s ch a dyspnea d s phama h r eness ice chan e ti htness about the neck cou h or str dor. S ons a d symptoms of ea l m edema ma be present. Mo t com mon of these symptom a e wei ht ain e v fatigabilt weakne dryn ss of the skm and mild m edematou face. At tmes tremor ne ousne in omnia palpit tion ert o and symptom related t the s mpath uc and central nervous s stem in v be p esent. These are u lly econdary to mild pres ur v mpt ms and are n t related to h perth r f m wh ch does not xi t. At best the c mplaint l pat nts wh truma l m p h matosa re ague w th the one ex ception th t the ha e a te and a fullness t ther th out.

With strum nb osa th i n t true. Pre ure symptom re ma k d otten t uch an e tent that ph i seem mm ent. Th re se m k d econd rrv nervu mpt m becau of th an x i t t created b ma k d pnea and ch k m e nsat on. The res lt f th m be a t bel el gted basal met bol rat. P nma or m not be present but uall bent. Th fur t n of the s mpt m i r t el b t as the se r itv brnes the pat nt t th d to n l u ll

not lon er than 1 to 2 years. Ca 7 i an ex ception to th rule.

With the 13 t cell a tant f struma fib a pain i ery ften the chi f c mpla nt nd occurs n the neck r should r with r d at n t the homolateral ear or back of the head. In Ca 11 the chief d m t n ompla nt wa a e pa n that sh t t the b ck of her head as ocated w th a d flu lvenla ed th rod. These two s mpt m should l avs lead one to suspect a subicute r chro c thyrod tis. There a e fte p esure symptoms of mild e e itv as oc tel w th the enlar ed land but these a e a able. Operat on is often undertaken ithin a fe eeks f the n set becau e of the p o ss on i p essu e s mpt ms and the presenc of nenla d l be l bes f the th rod h e ha dne s u e ts m l nancy.

Summar n the c mplaints presented by these three cl nicop th l mecal group in questi n stru ma l m p h m to s char cter ed by a d flu nlar ement usu ll of l n stan l n w th ague s o i t d compl nts. Struma fib sa i ma k ed by pr dor anc t p s re mpt ms w th ca mal condary nerv s mpt ms and no tende c t r d m e l m. Th gra i ll a ant f trum fibrosa ch a ter d t cute pain n n k r sh lde radi t e s de f the h d a d a nla ed itent der g iter. A p t v t of it Strumal m p h m t s esp nd ex l t theraj. Th i t c t a t to the la k f re s use t trum f b oia. The j n f p l t cell chr c th d us i unka n. A a theraj m lm st b used a d m n t test i t m l m p h m to s p d l th t a p l m t p ha b take t rule t m l m.

TABLE II—PATHOLOGICAL CHARACTERISTICS

	Struma lymphomatosa	Struma fibrosa	Struma fibrosa-gland
General appearance	Pseudobuberculous	Whitish	Grayish
Etiology	Various	Dyscrasia	Unknown
Associated	Fibrosis	Adenoma	Various
Endocrine	Normal	Normal	Normal
Clinical	Enlargement	Enlargement	Enlargement
Prevalence	Common	Common	Common
Age	Any age	Any age	Any age
Cell structure	Small cells	Large cells	Large cells
Stroma	Fibrous	Fibrous	Fibrous
Cellular	Small cells	Large cells	Large cells
Blood vessel	Normal	Normal	Normal

Isthmectomy. In general with or without operation cases with struma lymphomatosa tend to become myxedematous and must be supported by thyroid extract. Struma fibrosa and its giant cell variant seldom cause myxedema provided that enough normal thyroid tissue has been allowed to remain after thyroidectomy. However, in struma fibrosa pressure symptoms are apt to progress and there is often a residual hardness and induration to vary in the periphery of the lobes where resection was incomplete and as such these two groups are indistinguishable months or years after operation. The giant cell variant of struma fibrosa may subside spontaneously if left alone though its symptoms may be so annoying that operation can or be withheld. In conclusion the fact that every few cases of myxedema of the thyroid groups have a second peak is ample evidence that they become myxedematous with regard to their mechanical effects. Moreover, the effects can usually be alleviated by one operation. Struma lymphomatosa does progress slowly locally however as has been noted.

Lab tests. Laboratory examination offers little diagnostic aid with the exception of the basal metabolic rate which is usually normal or slightly elevated in struma fibrosa and in giant cell variant and low in struma lymphomatosa. If the basal metabolic rate is quite low the blood cholesterol may be elevated. An occasional constant feature is the marked increase in the McSwain and Moores test that is related to lymphocytes in the blood measured by the

struma lymphomatosa without elevation of the white blood cell count. The Wassermann and tuberculin tests are no different than would be expected in any group of people and are not a constant feature in their results. Cultures and bacterial smears of the thyroid have been constantly negative.

Pathology. In considering the pathology of these groups one should correlate the findings at physical examination, the gross surgical pathology, and the microscopic report.

Physiology. In struma lymphomatosa the glands diffusely firm occasionally it is described as hard. The largest gland described by McSwain was 177 grams. Often it is fixed to the trachea on allowing the gland to seldom tender. It may be asymmetrical in its enlargement but Jell states the normal thyroid is often asymmetrical in its development and occasionally a gland is lacking. This fact can explain the symmetrical enlargements of Case 1 and the markedly enlarged isthmus that was removed in Case 4. In struma fibrosa and the giant cell form of chronic thyroiditis diffuse enlargement occurs in about 70 percent of the cases. It is localized in the more lobes in the remainder. If the examination is carried out with care first in the tissues and then always noted. The gland is not tenderly handled less so a fairly constant feature in the chronic thyroiditis. In none of these forms a bruit heard. Nodules are very rarely felt and a cyst in which they are filled preoperatively were absent on urgent exposure.

Th is an important different al po nt from a malonant lesion Remonal lymph n des are seldom enlarged

Gross pathol The gross appearance of the gland corroborates a careful physical e aminati n with regard to s ze shape and consistency of the gland In struma lymph matosa the d flu e enlargement may proceed psteriorly in such fash on as completely to encrle the trachea The diffuse involvement includes all prolou ations and extensions of the gland The surface of the gland is smooth pinkish in color with a p eudol bul r or boss elated appearance The cut surface app rs fine lobula with a yellow cast that is char cteristic The e are n adjacent adhesions except a thicken n in some instances of the n rmally existin pretracheal attachment The landi frm in consistency at operative exposure though it may feel hard to preoperati e e amnation The amount of bleed n is variable t ope ation

In struma fibr sa the gross ap pe r nce is characteristic The gland is white glistenin smoothly enlar ed extremely hard avascula except where fibrous tissue maintains the patulousness of a large essel and densely adherent to su r undin soft tissue and pretracheal muscles The gland cuts with difficulty and resection s often physically impossible except by continual sh rp dissection without identity of adjacent structures nerves or vessels As in Case 7 the esophagu may be completely surrounded In no ca e of true struma fibrosa is this a fles e character stic lack ng unles a lobe is uninvolved In 30 per cent of the ca es the process is local zed t ne or two lobes of the thyroid Frequently th s fibrous enlargement of a lobe will encapsulate and c mp ess a colloid adenoma as was true in Case 7

The gross patho r f a pse d tant cell thyroiditis is ery similar to a struma fibrosa in shape consistency and extent of involvement except that th so m lacks adhes on to the surrounding soft tissues and if present they are less dense Very frequently howe e a perithy o lit is described in operative n te m hich thicken s of the capsule and an d ration f sur und n tissue e n ted Th s picture has been given p rticula emphasis by De Cour v (1) and will be discussed lat r unde et al r

Microscopic In this desc pt the st te and appearance f the ac nar ep thelium the presence or absence of ll d the ap pe rance and degree of fib osis in th str m of the gland the character of infiltrat cells and the stat f the blood essel warrant careful o sid rati

Struma lymphomatosa p se ts a drity and uniform de neration f the ac n s v denc d

by a flatten n of the epithelium to a very l w cub idal type ith eccentrically placed dark nuclei The acini shrink in s ze and bec me small r They have a tendency to coalesce with the f rma tion of pale de nerate cells Colloidi cants e absent Rarely does one see a p eudol bul r cell formed by an a mixture of remainin colloid an ac nar ep theli al cells Occasionally dependin n the level of the sect n with regard to n ve thyroid e cle one sees an intra ac nar cell mass of desquamated ep theli al cells and c llor if such is present One ee constantly an ncrea in fibrous connective tissue su r und n the lobule of de neratin ac n Th inc eas n amount as the disease proces c ntinues Often in the late ta es one may see c mplete fibrous repl cement of whole lobules H ever this fibr us t ue is of a finer vav n texture that serves to d tinguish it f om the hard coarse type found in struma fibrosa The tran ement of the fibr us t s e as umes characteristic wavy n hols about the lobules n the late states of th s disease and is often confused ith the ea ly appearance of the fibrous tissue n the giant cell vari nt of stuma fibrosa Here however as in struma fibrosa the fibrous tissue is hard and coarse Undoubtedly th pparent similitude has been the cause for m ny writers to consider the t s one disease process There is a diffu e infiltrati n of lymphocytes throu hout the gland in all cell lar planes nd betw een the acini There are numerous areas of lymph follicle with their characteristic germi al centers c mpo ed of large lymphocytes and reticulum cells with their motile s ures Plasma cell are occa i n lly seen Leucocytes r a e and f und ith d fficulty if at all Lar e monocytes are occas nally seen a l r rely ne sees a pseudomant cell hich has been described The e is no endarteriti o thicken n of the m l of a t eoles in stuma lymph mat r an l the e is o n lue vascular ty of the gland

Strum fibr sa p es nts a triking picture f hard den h al n ed tr ht fibrous t e and little else at a eual lant On su ther m spect n ne may n te c mpress on f ep theli al elements f the rem in In the n ol f areis h we e ther usually c mply to absence f ac n epithelium When pre nt in the u n l ed areas the ac n appe r fairly n rmal with vari n s es sh pes nd c ll d c nte t ffe epithelium t us ally n rmal c bod type ith cent al pl cel ucl l The e re ally mer us hr nic and ut nfl matory c lls th t ha e infiltrated th c n n et et ue planes Their mo nt depe d n the ca look l t a d the st e of the p oce In the late ta es f struma

fibrosa these infiltrating cells are less frequent. Scattered lymphocytes are most frequent. There are no germinal centers or areas of hyperplasia. Occasional leucocytes are seen. Plasma cells and wandering monocytes are seen in varying numbers. Occasionally pseudogiant cells are seen though even these are very rare or absent in the late stage which in brief shows little else but fibrosis. The arterioles show a thickening of the intima and media and the vessels are surrounded by a cuff of fibrosis in most instances.

The giant cell variant of struma fibrosa presents a much wilder picture microscopically. There is an acute degenerative process in the acinar epithelium and often in one low power field many stages of this degeneration may be seen. Acini appear normal in uninvolved areas. These stages of degeneration vary from only hyperchromatic nuclei to a calcification of epithelial cells with the formation of an intracellular cell mass or a pseudogiant cell. As the acinar epithelium degenerates the continuity of the wall of the vesicle becomes lost. First it thins in one area then proceeds to a more complete breaking up. Colloid is often left in open tissue spaces. In some areas large monocytes may be seen penetrating these cellular aggregates. In other areas where no colloid is present and no acinar epithelium can be distinguished these pseudogiant cells are indistinguishable from true foreign body cells of the Langhans type. In fact ultimately these cellular aggregates that include acinar epithelium monocytes and colloid may be true foreign body cells. This could result from absorption of the colloid and degenerate epithelial cells by the accompanying monocytes. This conclusion is borne out by the fact that in the late stages these giant cells have fewer nuclei than the earlier aggregates of cells. There is a marked increase in fibrous tissue that is hard coarse and often hyalinized though to a lesser degree than in struma fibrosa. It is arranged in characteristic lobular whorls and is to be distinguished from the late fibrosis of struma lymphomatosa as mentioned.

Interspersed are numerous lymphocytes and plasma cells. Occasional eosinophils can be seen. In areas numerous leucocytes are present and focal necrosis is suggested. No bacteria or spores or micro-organisms of any sort are seen that might implicate some specific etiology.

The small arteries and precapillary arterioles uniformly show thickening of the intima and media particularly if a silver tissue stain is used. This fact is very beautifully demonstrated by German using the Hortege's silver gold impregnation technique. It is also emphasized by De Courcy (11, 12).

Thus in these three clinicopathological groups irrespective of their relationships certain pathological characteristics are present. In struma lymphomatosa diffuse enlargement of the thyroid with dense lymphocytic infiltration and hyperplasia associated with degenerate acini may be seen. In struma fibrosa there are the dense perithyroid adhesions and diffuse fibrosis. In the giant cell variant of struma fibrosa one notes particularly the presence of cellular aggregates resembling foreign body giant cells with acute degeneration of the acini giving the gland a granulomatous appearance.

Pathogenesis and etiology. Little has been concluded about the relationship and etiology of these diseases. With regard to the relationship of struma lymphomatosa and struma fibrosa there are three trends of thought. First they are the early and late manifestations of the same disease process (Ewing Heyd Collier). Second they are different manifestations of the same process (Eisen, 17, Womack). Third they are separate and distinct pathological groups (Hashimoto, 30, Graham, 25, 26, 27, McClintock and Wright, Clute *et al.*, Harry Lee, Joll, Hellwig, McSwain and Moore). Throughout this paper emphasis has been placed on the latter view so that a restatement of their differences is unwarranted. Yet to consider the two entities one must have a concept of different etiologies.

Therefore the relationship of the so called pseudogiant cell thyroiditis to struma fibrosa is worthy of further attention. This brings up the entire subject of bacterial thyroiditis and toxic thyroiditis. It seems logical to conclude that the distinctions made in these groups are not justified.

When one considers the anatomical location of the thyroid, its rich blood supply, its proximity to the throat and nasal passages, it undoubtedly becomes contaminated frequently with bacteria of the flora of the mouth and nose and by bacteria from distant points with infections. The rich blood supply of the thyroid in general prevents bacteria from propagating. Thus the presence of an abscess on the one hand with a specific organism isolated and an acute nonsuppurative thyroiditis on the other are in a large measure the result of the balance of the virulence of the organism and the resistance of the host. Usually because of the rich blood supply focal or large abscesses seldom develop. Thus as Crotti stated a bacterial nonsuppurative thyroiditis is only a phase of a process whose last act is suppuration and there is no way of telling beforehand which way a given process will turn. If there is a pre-existing area of disease as a colloid adenoma this would ob-

vously be a *loci minoris resistentiae* and such a gland would be more susceptible to an inflammation of the suppurative or nonsuppurative variety. Numerous organisms have actually been identified in specific suppurative thyroiditis including the streptococcus, the staphylococcus, *Bacillus coli*, *Bacillus typhosus* and the pneumococcus. This supports the fact that the thyroid is often inoculated bacterially. It is well known that the blood stream will sterilize itself with surprising alacrity after showers of bacteria of different type by injection or from septic foci. Often the only clinical manifestation will be a chill and fever. Therefore in the thyroid these same conditions exist. After contamination with bacteria via the blood stream or lymphatics the thyroid becomes sterile because of its rich blood supply. Only the local toxic effects of the bacteria or their exotoxins on the acinar epithelium remain. The condition results in the so-called toxic nonspecific thyroiditis which may be of a mild or severe nature and may regress with few clinical symptoms or may progress. With marked acinar destruction and release of colloid a second group of irritating substances are freed in the intercellular spaces namely thyrolobulin and degenerate nonviable epithelium. These substances must be resorbed. Whether a proteolytic enzyme in the colloid exists whether it is activated if existent and whether it exerts an inflammatory effect if existent remain a question. Recent research suggests the presence of such an enzyme. This secondary process of repair and resorption is long and may or may not be attended with fever and toxic clinical symptoms. The end result is replacement fibrosis of the locally damaged areas. As De Courcy (11, 12) has emphasized there is often a local perithyroiditis noted at the time of operation which he believes creates a periaarteriolar fibrosis with thickening of the arterial intima and media. This condition may produce a compensatory fibrosis of the thyroid gland. He has compared this with Goldblatt's description of a compensatory fibrosis of the kidney after constriction of the renal blood supply. Thus in addition to a replacement fibrosis of damaged lobules there may be a secondary compensatory fibrosis of the gland of a progressive nature.

Inflammation of the thyroid by a specific filterable virus is a possibility but there is no evidence for or against such an agent at present.

This concept of the inflammatory origin of struma fibrosa and its giant cell variant is borne out experimentally. Chemical poisons such as phosphorus and silver nitrate cause a toxic thyroiditis with a histologic picture of acinar degenera-

tion on desquamation of epithelial cells scanty colloid and chronic acute cellular infiltration. De Quervain found that the introduction of bacterial toxins into the general and thyroid circulation had similar effects. De Quervain noted that the injection of a pure culture of bacteria into the artery of the thyroid could pass through without effects or might cause the disappearance of colloid desquamation of the epithelium and leucocytic infiltration.

Further there is a relation of the thyroid to infectious diseases in man. Sokoloff and Muller independently in 1896 first showed that in acute infectious diseases fatty degeneration of the acinar epithelium occurred with desquamation. Rover and Garnier in 1900 examined the glands of people dying from acute infectious diseases and came to similar conclusions as in almost every case marked microscopic changes occurred of a proliferative or a degenerative nature or both. In patients dying of tuberculosis a more dense sclerosis was noted leading to the conclusion that the denser fibrosis was due to tuberculous toxins. Similar results were reached later by De Quervain. Sarbach concluded after investigation of 67 cases that acute infections may produce thyroid histological alterations, their increase in size and number of alveolar cells, their degeneration and desquamation, liquefaction, diminution of the colloid and hyperemia. The connective tissue remains intact. Esmonet found in cachectic conditions such as carcinomatosis, tuberculosis and leukemia that epithelial elements underwent a fatty degeneration. Gerson's report on 26 thyroids examined from children dying of scarlet fever found similar changes to those noted.

Thus in addition to a direct local effect of bacterial toxins and bacteria on the thyroid there is a response of the thyroid often in a degenerative form to systemic diseases. This response is to be expected because of the thyroid's role in the regulation of metabolism which is altered by these diseases. Those who feel that struma lymphomatosa and struma fibrosa are different manifestations of the same process may cite this as evidence in that struma fibrosa may be the result of direct infection of the thyroid gland and that struma lymphomatosa represents the degenerative response of the thyroid to the thyroid being cause of its response to systemic disease. Perhaps this may rarely occur and may be the explanation of the etiology in Case 4, a male but if so the incidence of males to females should almost be equal in struma lymphomatosa.

The etiology of struma lymphomatosa is more obscure. As Jell concluded struma lymphomatosa

appeared to be neither inflammatory neoplastic nor degenerative in any way comparable with what is usually understood pathologically by such terms. The stimulus for the characteristic picture of diffuse lymphoid infiltration is difficult to account for. In fact the function of lymphoid tissue in general remains a mystery. Maximow states that the lymphoid tissue responds to local injury, is related to the extramedullary formation of lymphocytes and is related to the formation and function of macrophages.¹ Lymphoid tissue is rarely seen in normal thyroids of young adults but is more frequently witnessed in apparently normal thyroid glands of older adults over the age of fifty (Simmonds 57). It may be a response to a local degenerative process.

The fact that struma lymphomatosa occurs almost entirely in women in the fifth and sixth decades of life with an associated progressive tendency to myxedema seems to indicate a degenerative process in contrast to a neoplastic or inflammatory process. The thyroid is subject to excessive functional demands in women throughout their period of sexual activity, namely puberty, menstrual cycles, pregnancies and the menopause. It seems logical to conclude that through the years the gland burns itself out and the lymphoid infiltration and hyperplasia is a compensatory and replacement process for the slowly degenerating acini. The rather rapid hyperplasia locally of the lymphoid tissue often suggests great intrinsic almost neoplastic activity though not sufficient to relate it to any form of malignant degeneration as mentioned by Graham (26). Whether this degenerative process is preceded by an initial hyperplasia and toxic reaction remains a question. Some contend that this always occurs and thus they explain the focal areas of lymphoid tissue in a toxic goiter.

Boyden, Collier and Bugher are of the opinion that iodine ingestion is a possible factor. However in many cases no history of iodine ingestion is present. Furthermore few patients have thyroid disease of any sort who do not get iodine rightly or wrongly at some time or other in the course of their disease. The frequency of its administration particularly in struma lymphomatosa is evidence of its chronicity and cannot be considered justly as an etiological agent.

It has been considered. McCarrison produced a lymphadenoid goiter in 25 per cent of his

rats on a vitamin deficient diet. He fed potassium iodide salt. He suggested that a vitamin deficient diet was a possible etiology in man for struma lymphomatosa. His work is very interesting and may be significant though in many cases no history of dietary insufficiency is to be found.

One interesting discussion of etiology is that of Hellwig. He felt that overstimulation of the thyroid by the pituitary thyrotropic hormone was responsible for its involution and degenerative changes. He aptly makes the comparison of the microscopic appearance of struma lymphomatosa to chronic cystic disease of the breasts. The work of Uhlenhuth in 1926 showing that the colloid release phase is affected by the thyrotropic hormone is emphasized by Hellwig. This work has been carried a step further by the experiments and microdissection of the thyroid follicles of rats by De Robertis in 1941 and by Dziemian in 1933 at Johns Hopkins. They found that the proteolytic enzyme factor in colloid was affected by the thyrotropic hormone. Administration of thyrotropic hormone caused a decrease in the viscosity of the colloid thus facilitating its release.

The end result of a rather large amount of speculation and very little actual research is essentially that the etiology of struma lymphomatosa is unknown. Because of this one cannot state with definiteness its precise relationship with any of the existing known diseases of the thyroid gland. Thus one must continue to regard struma lymphomatosa as a clinicopathological entity of unknown etiology, and not for the present at least a specific disease. Struma fibrosa on the other hand seems quite definitely from the cases studied and from reports in the literature to be the result of an inflammation of the thyroid of a bacterial origin. The pseudogiant cell type of thyroiditis described by De Quervain does not seem to be a disease *sui generis* as he maintains but one variant of the protean manifestations of the thyroid gland to inflammation of bacterial origin.

DIFFERENTIAL DIAGNOSIS

Obviously the most important differential diagnosis for these groups is from malignant growth. Due to their infrequent occurrence one's first acquaintance with the disease is often at the operating table. The question of malignant growth has either been raised clinically preoperatively or imposes itself on exposure of a firm or hard gland. In mistaken diagnosis of malignancy the surgical error is usually one of commission and not omission. There is an attempt made at total excision of the thyroid with often unilateral or bilateral damage to the recurrent

Rec. research has been made by the lymphocyte re-
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laryngeal nerves parathyroid tetany myxedema or varying combinations of these complications. One case is known in which all the complications occurred postoperatively. Complete resection of a struma fibrosa is usually mechanically impossible. Complete resection of a struma lymphomatosa is technically easy but unnecessary and actually very undesirable from a physiological point of view. Therefore to endanger the patient's well-being and even life by a total resection of the gland is not justified except on a definitely positive diagnosis of malignant lesion supported by microscopical section.

The differential features are easy to describe but often difficult to apply when there is a specific case in question. In general cancer occurs in 1 to 2 per cent of all thyroidectomies. It is rare for a cancer to occur in a previously normal gland. Cancer usually occurs between the ages of 40 and 60 with wide variations; however and with twice the frequency in females. Usually the malignant tumor is nodular with an irregular surface contrasted to the diffuse smooth enlargement in these groups of cases. There is frequent invasion of adjacent tissues with removal of lymph node involvement. This condition may be quite difficult to distinguish from a large hard struma fibrosa. However the diffuseness of the latter process is often confined to one lobe and its excessive hardness serves to differentiate it from a malignant tumor. If the clinician has any doubt on review of the clinical history, gross pathology or even frozen section it is advisable to wait for permanently stained microscopic sections.

TREATMENT

Treatment should be aimed at relief of symptoms. A positive diagnosis is essential. Thus biopsy irrespective of the form of treatment should be carried out as a preliminary procedure if there is any question of the diagnosis at operation or if treatment solely by x-ray is contemplated.

In general the best results are obtained by the most conservative means. The use of x-ray only, following biopsy, has given excellent results in struma lymphomatosa. It may almost be used as a diagnostic test. The response is rapid and the gland will shrink markedly in size in 2 or 3 weeks. A rubber collar has been described by Renton and associates. Deep x-ray of high enough voltage is sufficient up to 1000 to 1500 r on each side of the neck in divided doses of 100 to 200. Time must be allowed to elapse between courses of radiation to allow for skin tolerance of the amount of radiation given. In Case 4 the patient had a permanent

regression of the gland after 800 r to each side of his neck anteriorly. In Case 6 the patient had an immediate response to the same amount 800 r within 2 weeks but she had a recurrence of the size of her thyroid after 6 weeks. She received another course of 600 r with excellent results.

The effect of x-ray therapy on pseudomalignant cell thyroiditis may be sufficient to warrant its use. However it is hard to evaluate as this earlier more acute form of thyroiditis often subsides spontaneously and without operation. X-ray therapy is ineffective for the late stages of fibrosis described under struma fibrosa.

Surgical treatment is carried out for one reason—the relief of the mechanical effects of the enlarged or fibrous gland. In struma lymphomatosa the patient is usually in a hypothyroid state. Therefore the less subnormal tissue removed the better for functional reasons provided that sufficient tissue is removed to relieve mechanical symptoms. Furthermore struma lymphomatosa may have a tendency to regress after a number of months. Case 3 is an example in which the maintenance dose of thyroid is now much less than immediately after operation. In advanced struma fibrosa removal of a strip or wedge of tissue overlying the trachea is all that can be physically accomplished in many cases without undue danger to the patient. The amount of tissue excised of course depends on the findings with each patient. With pseudomalignant cell form of chronic thyroiditis with fewer perithyroid adhesions subtotal excision of a lobe or lobes or the removal of a wedge of tissue over the trachea is much easier. One should remember however that normal tissue need not be excised and that the disease usually spontaneously regresses. Therefore excision of involved tissue in all cases should be as conservative as possible.

With regard to the actual technique of surgery little need be said. The potential complications have been mentioned. Because of the greater mechanical difficulties in surgery on thyroid glands with marked fibrosis and adhesions to surrounding soft tissues the frequency of these complications is greater. For this reason one must use extreme care particularly with regard to the recurrent laryngeal nerves. Damage to these nerves undoubtedly is the cause for frequent tracheotomies in many of the earlier cases reported and not because of a protraction of the disease. The entire purpose of the operation—to relieve obstruction to an airway—is defeated when one or both of these nerves are cut. Acute asphyxia may occur when paralyzed vocal cords are added to an already embarrassed airway. Therefore

for the postoperative safety of the patient the vocal cords should be inspected upon conclusion of the operative procedure as well as between stages of the operation when it is in progress. Tracheotomy may thus be anticipated and actually performed if necessary thus reducing the risk of asphyxia to the patient. The use of an intratracheal tube for administration of anesthesia may be a necessity for an adequate airway if general anesthesia is used.

The results of surgery in general are good. This is borne out by the fact that so few cases have had second operations. The patients with struma lymphomatosa almost invariably need supportive thyroid extract irrespective of the amount of the gland excised though less thyroid extract will be necessary if more thyroid tissue is allowed to remain. In the more acute forms of thyroiditis with out marked fibrosis relief of symptoms is usually quite prompt and permanent. As one might expect the results of surgery in a late struma fibrosa are often poor. The poorer end results are primarily because of the nature of the pathology and secondarily because of postoperative surgical complications of recurrent laryngeal nerve paralysis parathyroid tetany and occasionally myxedema.

SUMMARY CONCLUSIONS

Riedel first described a diffuse fibrosis of the thyroid in 1896. In 1904 De Quervain first described a giant cell type of thyroiditis. In 1912 Hashimoto described a diffuse struma lymphomatosa. Since these original descriptions there has been much confusion of case reports though at present struma lymphomatosa is considered by most a clinicopathologic entity despite the weight of Ewing's opinion to the contrary. Struma fibrosa and its giant cell variant have been confused in the literature and no attempts have been made to present their relationships.

Eleven cases are presented with clinical and pathological evidence to support their diagnosis. Six cases were diagnosed struma lymphomatosa, 2 cases were diagnosed struma fibrosa and 3 cases represent the earlier more acute giant cell variant of struma fibrosa.

The three small groups of cases are discussed separately to emphasize their relationships similarities and dissimilarities. Their clinical and pathological characteristics are summarized in Tables I and II.

Struma lymphomatosa is considered a distinct clinicopathologic entity. Its etiology is unknown though it is considered a degenerative disease in contradistinction to a neoplastic or inflammatory

disease. The excessive demands on the thyroid during the sexual life of the female are considered fundamental in the etiology of this disease. The excessive demands may be mediated through the hypophysis.

Struma fibrosa and its giant cell variant are considered two late manifestations of the thyroid from an acute to chronic inflammatory process. The fibrosis of the gland is considered first a replacement phenomenon of damaged glandular tissue. In later stages the diffuse infiltrating type of fibrosis may be due to a compensatory mechanism through constriction of the arteriolar blood supply of the gland from a coincidental perithyroiditis.

The pseudogiant cells are merely evidence of the more acute nature of the inflammatory process which may regress or more rarely progress to a diffuse infiltrating fibrosis.

Emphasis is placed on the protean manifestations of the thyroid gland to inflammations resulting from bacterial systemic disease and poisons. By nature of its rich blood supply suppuration is rare. The role of a virus as an inflammatory agent is yet undetermined.

The important differential diagnosis is from malignant growth.

Treatment of struma lymphomatosa by radiotherapy is the method of choice after a preliminary biopsy.

Surgery of struma fibrosa should be as conservative as possible. Its purpose is the relief of mechanical effects only as this disease is not neoplastic. Radiotherapy may be effective in the earlier more acute giant cell variant of struma fibrosa. The risk of operative complications of parathyroid tetany and recurrent laryngeal nerve paralysis is markedly increased in any radical attempt at extirpation of the gland and nullifies any potential relief of preoperative mechanical obstructive symptoms to the airway of the patient.

The end result of treatment barring surgical complications is usually good though with struma lymphomatosa there is a progressive tendency to myxedema.

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ADENOMA OF THE BRONCHUS

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BRONCHIAL adenoma is one of the most interesting of the lesions involving the tracheobronchial tree. Mueller in 1882 described the first case of bronchial adenoma. His patient had complained of hemoptysis and expectoration of purulent material for 8 years. At postmortem examination a pedunculated adenoma was found in the left main bronchus with numerous bronchiectatic cavities distal to the neoplasm. Very little attention was paid to this interesting type of tumor until Reisner in 1928 reported a case of polypoid adenoma of the right lower lobe bronchus. Since then there has been a rapidly accumulating literature dealing with this tumor. The development of modern diagnostic methods has facilitated a more thorough study of these neoplasms and it has been found that they are not so rare as once was thought. There still exist marked differences of opinion among observers as to whether bronchial adenomas should be classified as benign, potentially malignant or actually malignant tumors. There also exist differences of opinion as to the most satisfactory method of treatment. In order to aid in the better evaluation of these problems we are presenting our experience in 38 consecutive cases of adenoma of the bronchus encountered at the Mayo Clinic.

CLINICAL FEATURES

In contrast to bronchiogenic carcinoma which occurs most frequently among men more than 40 years of age, adenoma of the bronchus is usually reported to be most common among women less than 40 years of age. In Brunn and Goldman's series of 4 cases of adenoma of the bronchus 64 per cent of the patients were women and the average age was 27 years. Clerf and Bucher have reported 35 cases in 54 per cent of which the patients were women and in 43 per cent of which they were between 20 and 30 years of age. Mason and Coberth collected data on 60 cases from the literature and found that 70 per cent of the patients were women. In our group of 38 cases 22 (57.9 per cent) of the patients were women and 16 (41.1 per cent) were men (Table 1). The average age of the patients was 37 years and 18 (47.3 per cent) were less than 40 years of age. It is of inter-

est to note that the average age of the men who had adenoma of the bronchus was 35.3 years and that of the women 38.5 years.

Adenoma of the bronchus is characterized by the fact that it is usually slow growing and the initial symptoms and physical findings are of such a nature that the condition is often allowed to go a considerable period before being recognized. In one of our cases the patient had no specific pulmonary symptoms, the lesion having been discovered during the course of a routine roentgenographic examination of the thorax and in another case the condition had existed for 8 years before being diagnosed. In our series of cases the average duration of symptoms was 26 months before the diagnosis was established. This is in marked contrast to the experience of 2 of us (Moersch and Tinney) with carcinoma of the bronchus in which we found that the duration of symptoms before the diagnosis was established was less than 8 months.

The symptoms produced by adenoma of the bronchus may be quite variable. Wessler and Rabin Laff and Jackson and Konzelmann mentioned hemoptysis as the cardinal manifestation of a bronchial adenoma. The hemorrhage is usually described as being characterized by sudden onset and abrupt termination without much blood streaking of the sputum between the attacks. Bleeding was present in 54 per cent of our cases but was an initial symptom in only 22 per cent. In no instance was the character of the hemoptysis different from that caused by any other type of intrabronchial lesion. Clerf and Bucher and Goldman and Stephens have noted that the hemoptysis may be more prominent during menstruation than at other times. We have not observed this phenomenon.

In our experience cough has been the most frequent symptom associated with adenoma of the bronchus; it occurred in 85 per cent of our cases. In the early stages of the disease the cough is non-productive. As the tumor enlarges it gradually obstructs the bronchus, interfering with the normal bronchial drainage and eventually causing atelectasis of the distal portions of the affected lobe. When this region of atelectasis is secondarily infected the cough becomes productive of purulent sputum. The occurrence of preceding

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TABLE I—SUMMARY OF THIRTY EIGHT CASES

Case No.	Age years	Treatment	Survival (months)	Brother involved
M	3	Pneumectomy	mon.	Right upper lobe
F		Pneumectomy	†	Right main
F		Pneumectomy	mon.	Left upper lobe
F		Pneumectomy	rs.	Left main
F		Pneumectomy	1	Left upper lobe
6 M		Pneumectomy		Left lower lobe
F	5	Pneumectomy	Died	Right upper lobe main
8 M		Pneumectomy	†	Right upper lobe
F		Lobectomy	†	Right lower lobe
F	5	Pneumectomy	†	Left lower lobe
F		Diathermy and ra	Died	Right main
F		Lobectomy	6 mos.	Middle lobe
F		Lobectomy	8 mos.	Right lower lobe
F		Lobectomy	mon.	Left lower lobe
M		Lobectomy	mon.	Middle lobe
6 F	5	Diathermy and ra	5 rs.	Right lower lobe
M		Diathermy and ra	rs.	Right main
3 M		Diathermy and ra	8 rs.	Right main
9 F	5	Diathermy and ra	yr.	Left lower lobe
M	51	Diathermy and ra	Died	Left lower lobe
F		Diathermy and ra	rs.	Left lower lobe
F		Diathermy and ra	yr.	Left upper lobe
3 F		Diathermy and ra (ratio)	mos.	Left lower lobe
F	3	Diathermy and ra	26 mos.	Left main
M		Diathermy and ra		Right lower lobe
M		Neurectomy		Right main
M		Neurectomy	Cath. yrs.	Right upper lobe
3 F		Neurectomy	rs.	Right lower lobe
F		Diathermy and ra	rs.	Right lower lobe
F	6	Diathermy and ra	yr.	Right lower lobe
F	45	Diathermy and ra	yr.	Right main
F	6	Diathermy and ra	yr.	Right main
F		Diathermy and ra	8 mos.	Left main
24 F		Neurectomy	rs.	Right lower lobe
F		Neurectomy	yr.	Right lower lobe
F		Diathermy	mos.	Left upper lobe
F	20	Diathermy	mos.	Right lower lobe
F		Diathermy	Under treatment	Left upper lobe

*The first two rows in this table are the same as those in Table II. They are listed in the same order.

TABLE II—ADENOMA OF LUNG PATHOLOGIC FINDINGS IN CASES IN WHICH LUNG WAS AVAILABLE FOR STUDY

Case	use f ummo em	p bro hial as an	C ndi	f lung dis al mo	f
		1	Modera pneum bro hiectasi	31 d	
	3	2	Modera bronchectas Modera p ummo	f ll bronchi	
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		Yes	31 d bro h tasi	f ummo	
		1	1 ked bro h ec a	31 d pne on	
6		1	31 bro hiectas and pneumon		
7	b b	1	31 1 f bro hiect a. and		
8		Yes	3 ked bron hiectas	d p ummo	
		2	lod ra bro hiect	nd ne	
	b b	1	f k d b hiect	d um	
1		1	k d bro ch ec asi	nd	
		1	Fra call cum ni	bro hiect as	
	b b	Yes	31 ked bro hiect a.	nd p ummo	
3		Yes	Fra call um ni	bronchectas	
5	b b	1	f ked bro chiectas	d p um	

Lymph node infiltrated with	plasma	↑ Necrosis
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and often recurrent attacks of pneumonia in the same lobe was frequently noted. In 46 per cent of our cases there was a history of one or more attacks of acute pulmonary infection and in many instances the first evidence of an endobronchial lesion was an acute febrile episode usually diagnosed as pneumonia.

Another important symptom caused by the bronchial obstruction is the so called asthmatic wheeze which may vary from slight wheezing respiration to rather marked asthma or even severe stridor. Since these tumors fairly frequently have long pedicles the attacks of asthma may be precipitated by change of position and often appear at night. Wheezing was a prominent symptom in 3 per cent of our cases and was the initial symptom of which the patient complained in 4 per cent.

If the bronchial obstruction is allowed to persist without treatment pulmonary suppuration ultimately develops in the distal portions of the affected lobe. This may take the form of bronchiectasis, pulmonary abscess, pulmonary gangrene or empyema. In 23 per cent of our cases there

as clinical evidence of pulmonary suppuration. These secondary processes sometimes become so marked that they fairly frequently obscure or even obliterate the primary lesion. In fact pulmonary suppuration rather than the tumor *per se* is the chief cause of death in most cases.

Since the signs elicited by physical examination are usually dependent on the degree of broncho stenosis and the amount of pulmonary suppuration they may vary considerably. Over the affected region there are usually decreased expansion of the thorax, impaired resonance and decrease of breath sounds.

ROENTGENOGRAPHIC EXAMINATION

Direct or indirect evidence of an endobronchial lesion may be obtained by roentgenographic examination of the thorax. The tumor mass can at times be clearly outlined by tomographic studies and at times can be outlined if a roentgenogram is made after the bronchi have been filled with iodized oil. A region of atelectasis is indirect evidence of bronchial obstruction and should cause one to suspect an endobronchial tumor. In 7 per cent of this series of cases an obstructing lesion of the bronchus was suspected on roentgenographic examination.

BRONCHOSCOPIC EXAMINATION

Although inspection of a specimen obtained during bronchoscopic examination is essential in deter-

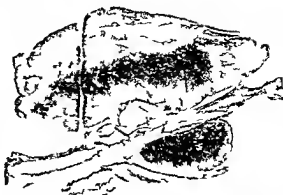


Fig. 1. to th h l m f th l h
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mining the exact nature of any endobronchial lesion these neoplasms generally present such a typical gross appearance that the bronchoscopist is frequently able to make a correct diagnosis from the gross appearance alone. There is partial or complete occlusion of the bronchus by a smooth, freely movable, soft vascular mass which may appear pink, red or purple. The surface of this polypoid lesion is characteristically smooth and rarely ulcerated but slight contact may precipi-



Fig. 2. Ad h f b h Th p th l t t ly p th l l d
th t h l l p e b b l t m f l t m A l s d l l g
f h b h l l th m H t y l e o



FIG. 3. Adenoma of the bronchus. Gross specimen. Diagrammatic representation of the tumor. The tumor is situated in the lower lobe of the lung, and is shown in cross-section. The tumor is a large, dark, irregular mass, and is surrounded by a thin layer of connective tissue. The tumor is situated in the lower lobe of the lung, and is shown in cross-section. The tumor is a large, dark, irregular mass, and is surrounded by a thin layer of connective tissue.

tate rather marked bleeding usually the entire surface of the bronchial wall

PATHOLOGY

Although adenoma of the bronchus presents a almost characteristic gross appearance the final diagnosis must rest on positive microscopic evidence. In 11 of our 18 cases the diagnosis of adenoma of the bronchus was established by positive microscopic evidence. In 7 of the cases this was based on tissue removed endoscopically. In 4 of the cases (Table II) the tumor was available for microscopic study while in 3 cases necropsy material was available.

Gross Features. The adenomas ranged considerably in size the smallest being millimeters in diameter and the largest centimeters in diameter. The color and width of the pedicle attaching the tumor to the bronchus varied greatly. Generally the site of attachment of the adenoma to the bronchial wall was narrower than the greatest width of the tumor. In 1 case this was very strikingly illustrated. In this case the greatest diameter of the tumor was 8 centimeters

but the pedicle at its attachment to the bronchial wall was only 3 millimeters in diameter.

There is a tendency for adenoma of the bronchus to infiltrate the bronchial wall and the peribronchovascular tissues. In 1 of the 13 cases in which the lung was available for study there was invasion of the bronchial wall and peribronchovascular tissues (Fig. 3). In the remaining 2 cases there was no infiltration of the neoplasm into the bronchovascular system. In 1 case the main mass of the tumor was within the bronchial lumen.

Adenomas invariably arise from the main stem or larger bronchi. The right lung was more frequently involved than the left. 3 of 6 cases the lesion was located in the hilum and in 3 cases in the left lung (Table I).

The condition of the lung distal to the neoplasm depends on the degree of bronchial obstruction which the tumor has produced. Various degrees of bronchiectasis were encountered. Since the neoplasms were usually situated in a large bronchus bronchiectasis when present frequently involved a large portion of the bronchovascular stem either focally or occasionally if the entire lung. Pneumonia in various degrees accompanied the bronchiectasis. In all but 1 of the 3 cases in which the lung was available for study there was some bronchiectasis. Example shown in Figure 3. In this case the adenoma had been fulgurated electrically and the bulk of the structure removed. The bronchiectasis and pneumonia remained however and were obviously responsible for death.

No metastatic growth was found outside the thorax in the cases of adenoma of the bronchus in which necropsy was performed. In 1 case only was a local hilar lymph node involved and this node was adjacent to the neoplasm.

Histologic Features. The more marked difficulties connected with the accurate histologic diagnosis of this type of neoplasm from a small specimen of adenoma of the lung is likely to be confused with other lesions histologically. It must be differentiated from the histiocytic sarcoma, small cell bronchogenic carcinoma. This is important because of the vital difference in prognosis of these two lesions. However, on a cellular basis it is not often necessary to differentiate between these two lesions. Although the characteristic features of the small cell sarcoma are little with two types of neoplasms several differential features were found helpful. Most of these can be found in the tumor cells of the bronchogenic carcinoma type but are all absent in the adenoma type. Degeneration of the tumor cells (pleomorphism, hyperchromatism and necrosis) is much more common in bronchogenic carcinoma than in adenoma.



Fig. 4. Adenoma of the bronchus. Hyperplastic type of epithelium. (S. Yre) Th. should not cause difficulty because infarcts usually occur in the periphery of the lung where adenomas are not seen. Because of its peripheral location this lesion is encountered at necropsy but not bronchoscopically. A diagnosis of carcinoma in the region of an infarct of the lung should be treated with considerable skepticism.

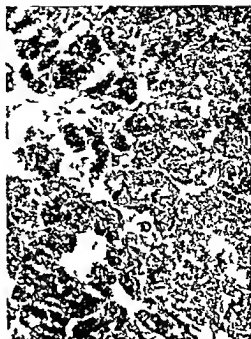


Fig. 5. Adenoma of the bronchus. Hyperplastic type of epithelium. (S. Yre) Th. should not cause difficulty because infarcts usually occur in the periphery of the lung where adenomas are not seen. Because of its peripheral location this lesion is encountered at necropsy but not bronchoscopically. A diagnosis of carcinoma in the region of an infarct of the lung should be treated with considerable skepticism.

Another lesion that must be differentiated from an adenoma of the bronchus is the hyperplastic type of epithelium which is seen about infarcts of the lung (S. Yre). This should not cause difficulty because infarcts usually occur in the periphery of the lung where adenomas are not seen. Because of its peripheral location this lesion is encountered at necropsy but not bronchoscopically. A diagnosis of carcinoma in the region of an infarct of the lung should be treated with considerable skepticism.

The type of cell which is consistently present in an adenoma of the bronchus is a fairly small rounded cell which does not have marked hyperchromatic staining of the nucleus. There is little variation in the size of the cell. We have been impressed by the remarkable histologic similarity of all 38 different adenomas. Mitotic figures are practically absent in the neoplastic cell populations.

The tumor cells consistently make an attempt to form acini but are rarely very successful in their attempt. The result is that the cells group themselves into alveolar groups of cells which have poorly formed lumens or else they group themselves into cords of cells (Figs. 4 and 5). Womack and Cahan have considered that similarity exists between the adenoma and the malignant tumor of the salivary gland. The final differentiation of cartilage and

bone in the substance of these tumors is not difficult to explain when one considers that invasion through the bronchial wall does occur and that the bronchial wall has cartilage in it which sometimes turns to osseous tissue.

Invasion of a lymph node as present in only one case. In this particular instance the involved lymph node was adjacent to the tumor and it seems probable that this process does not represent metastasis in the sense of a tumor embolism but rather represents a direct invasion of the lymph node (Fig. 6). In no instance in this series did metastasis occur to the other lung or outside the thoracic cavity. Ultimately this feature differentiates the adenoma type of lesions from bronchogenic carcinoma.

Between the groups and cords of epithelial cells there usually was a thin stroma of connective tissue. In this stroma we found large numbers of thin-walled blood vessels lined by endothelial cells. A noticeable feature of adenomas of the bronchus has been their vascularity. It is no wonder that bleeding is a prominent feature in the clinical course of these neoplasms. In fact many adenomas morphologically simulated neoplasms of blood vessel. The epithelium overlying the tumor was frequently flattened so that it was ulcerated. In no instance the tumor cells seemed



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to a se directly from the peribronchial mucous glands (Fig 7). It seems probable that the surface epithelium of the bronchus which is the usual source for the origin of bronchiole carcinoma sent always and indeed may never be the source from which the adenoma originates.

Adenoma of the lung in many ways similar to types of neoplasm in other parts of the body, namely basal cell carcinomas (rodent ulcers), cylindromas, carcinoid tumors of the appendix and ileum, islet cell tumors of the pancreas and adenomas of the parathyroid. The similarity is based not only on the slowness of growth and tardiness to metastasize but also on morphologic grounds.

It is obvious from this study and others that adenoma of the lung is a neoplasm of the lung itself. It cannot be compared in so far as prognosis is concerned with bronchiole carcinoma. Although occasionally it resembles bronchiole carcinoma. Morphologically for the most part the cellular picture is utterly different. The slowness of growth and low metastasizing factor are features of bronchial adenoma which remove it from the realm of bronchiole carcinoma. However, because of the fact that it has the potentialities of invading the peribronchial tissue and lymph nodes (Fig 6) and because it can become a space-occupying lesion obstructing the bronchus and thereby producing bronchiectasis and infection of the lung, bronchial adenoma a lesion that if left untreated will eventually kill the patient. For these reasons it seems better to think of bronchial adenoma as malignant thereby admit to their potentialities for killing the patient but

at the same time sharply differentiating them from the ordinary type of bronchiole carcinoma.

PROGNOSIS

In studying the prognosis of cases of bronchial adenoma it is interesting to divide the series into those in which treatment was surgical (pneumonectomy or lobectomy) and those in which treatment was more conservative (surgical diathermy, radium or roentgen rays). These data may be summarized from Table I. In 14 cases in which lobectomy or pneumonectomy was performed there was a death or a mortality rate of 72 per cent. In 22 cases in which treatment was by means of surgical diathermy, radium or roentgen rays there were 14 deaths or a mortality rate of 64 per cent. These 2 patients did not die directly as the result of the treatment but 6 months later of other causes. Two of the patients did not receive any treatment, one of these we have not been able to trace and at the time of writing the other was still alive and a year after his registration at the clinic.

TREATMENT

The choice is a difference of opinion of several as to the most satisfactory method of treating bronchial adenoma. Generally the decision rests between attempting endoscopic removal of the lesion and extirpation of the lesion by means of lobectomy or pneumonectomy. The method to be employed must necessarily depend on many factors such as the patient's age and general state of health, the location of the tumor and especially its relationship to the bronchus, the degree of second

ary pulmonary suppuration and the degree of peribronchial infiltration of the adenoma. The fact that peribronchial infiltration is so prevalent in cases of adenoma of the bronchus would seem to favor lobectomy or pneumonectomy as the procedure of choice. On the other hand, lobectomy or pneumonectomy is an operation for adenoma of the bronchus is still a very formidable procedure and one that as yet carries with it a definite element of risk. Furthermore, peribronchial extension of the adenoma of itself as experience has demonstrated is not always as serious a state as might be expected.

At the present time it is our practice to employ the conservative form of treatment in those cases in which the adenoma is attached to the bronchial wall by a comparatively narrow pedicle, is movable and is situated in a bronchus that can be adequately and thoroughly visualized bronchoscopically. The degree of peribronchial invasion is as a rule extremely difficult or impossible to evaluate from gross inspection. Bronchoscopic removal of the tumor is also indicated when the adenoma is situated so close to the cornea that surgical treatment would be inadvisable and also when the general condition of the patient is such that lobectomy or pneumonectomy is unduly hazardous. The advantage of bronchoscopic removal lies in its comparative safety. It is imperative that patients thus treated be followed by at least yearly bronchoscopic checks to be certain that adenoma does not recur. There is no other method to detect early recurrence.

Lobectomy or pneumonectomy is the procedure of choice when the adenoma is situated in a bronchus that cannot be adequately visualized bronchoscopically. It is generally preferable in those cases in which there is marked evidence of associated pulmonary suppurative disease. It is also preferable when there is obvious evidence of peribronchial infiltration or when an adenoma of the bronchus has been treated endoscopically and tends to recur.

The dominant feature of surgical removal of the tumor is primarily in the fact that after the lesion has once been removed, this manner recurs rarely. It is extremely rare hereafter follows in clinical practice removal of such recurrences are comparatively common. With the great strides that have been made in the field of thoracic surgery and the related surgical mortality associated with lobectomy or pneumonectomy for adenoma of the bronchus are employed in this method of treatment with increased frequency. The conservative form of treatment still has a definite field of usefulness. However, it still holds a very honorable place in the treatment of adenoma of the bronchus.

At times it may be of advantage to combine the two methods of treatment. In Case 23, Table I, the adenoma was situated in the left lower lobe bronchus and was associated with marked secondary pulmonary suppuration. Surgical treatment seemed indicated and was employed. On exploration the lung was found bound down by a mediastinal mass that would not permit pneumonectomy or lobectomy. Subsequently the tumor was destroyed by endoscopic means and the patient has remained well up to the present time with no evidence of recurrence.

The problem of treatment is further complicated by the fact that in certain instances favorable results may be obtained from roentgen therapy alone, as is well illustrated in Case 34, Table I, in which the patient is still alive and well 12 years after treatment, although the tumor itself is still present. Roentgen therapy as a rule does not seem to influence the size of the adenoma markedly, although at times it does seem to have a limiting effect on its development.

CONCLUSIONS

Adenoma of the bronchus is a relatively common tumor involving the tracheobronchial tree.

2. It occurs usually among younger persons than does carcinoma of the bronchus and in contrast to bronchogenic carcinoma is more common among women than among men.

3. It is generally slow growing and usually gives rise to clinical symptoms over a much longer period than carcinoma of the bronchus before the diagnosis is established.

4. In our experience cough is the most frequent and earliest symptom of adenoma of the bronchus. Hemoptysis, asthmatic wheeze and recurrent bouts of pulmonary infection are other common symptoms.

5. Adenoma of the bronchus generally presents a characteristic bronchoscopic picture but the final diagnosis must rest on microscopic examination.

6. Adenoma of the bronchus presents a characteristic microscopic picture. Mitotic figures are usually absent. The type of cell is consistently a fairly small roundish cell which does not have marked hyperchromatism of the nucleus. The tumor cells consistently make an attempt to form acini but rarely very successful in the attempt. A noticeable feature of all adenomas of the bronchus has been the vascularity. In no instance in our series did metastasis occur to the other lung or outside the thoracic cavity. From our study we feel that adenoma of the bronchus should be regarded as a neoplasm of the lung. *Am J Surg* 1915

The method of treatment to be employed in cases of adenoma of the bronchus depends on the situation of the tumor, the degree of second or pulmonary suppuration and the patient's general condition. In our experience endoscopic destruction of the tumor and destruction by surgical extirpation of the tumor by means of lobectomy or pneumonectomy are the most satisfactory methods of treatment.

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AN EVALUATION OF THE COFFEY I METHOD FOR URTEROINTESTINAL ANASTOMOSIS

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New York New York

THE many and varied procedures devised for transplant the ureters into the bowel suggest that no highly satisfactory method is yet available. The Coffey I operation in our hands has been reliable though not ideal. This technique probably is not the final solution of the whole problem nor is our application of it perfected. This relatively old procedure has been overshadowed by emphasis on newer methods. Thirty-nine consecutive cases are here reported to demonstrate early results and to offer some comparison with reports on other methods. No attempt is made to discuss the general treatment of bladder cancer, cystitis, and other conditions for which urinary diversion may be advisable.

The conditions for which transplantation might be desirable are common. Hence the technique preferably should be one readily mastered by the well-trained surgeon. Some of the methods described in the literature seem to require unusual manipulative skill. If such highly specialized methods yield definitely superior results, then it behooves surgeons and urologists in particular to acquire the needed special skill. Upon a review of the literature we find no method which has produced results superior to those following the Coffey I method as demonstrated clinically by a consecutive series of reanastomoses. The Coffey I method is simple and direct. In general, highly specialized techniques are less enduring than simple direct procedures. The care of course is not negligible. Most reliable operations are not only based upon established surgical principles but also apply these principles as directly as the situation permits.

When the Coffey I procedure is used, all steps may be visualized so that the operator knows what is done. Manipulation of the peritoneum, the rectum, the intraperitoneal catheter, and the ureter are the effect of a suture and the like. Representative illustrations of the Coffey I method (Fig. 1) and the Coffey II method (Fig. 2) are shown. The Coffey I method is the one which is described in this paper.

must occur or complete failure results. This fact is recognized by some proponents of such method who have advised placing gauze or a tube in the lower bowel and including this gauze or tube in the necrotizing sutures. Then if the cut through is not forthcoming, traction on the packing or tube is added—an essentially blind maneuver. With Jewett's method (11, 12) the formation of the actual stoma is accomplished solely by touch and is tested by passing a sound through the ileocecal junction and ureteral walls. Tangential cuts have been made with Jewett's instrument with disastrous results from leakage. To avoid some of these difficulties, Jewett has devised a set of bulb sounds. He also advised inflation of the rectum with air and more extensive mobilization of the bowel. In passing, one not uncommon fault of the highly specialized methods is that the procedure may become more and more complex with each perfection.

Manipulation and contamination can be reduced to a minimum particularly when both ureters are transplanted at one operation. Of the last 10 cases in our series only 1 was done in two stages. The Hynes and Jewett operations require two stages to complete any one anastomosis (though the first stage of both sides is usually done at the first operation while at the second stage the anastomosis is completed bilaterally and often other surgical procedures are carried out). Adhesions encountered at the second stage have been a major problem, but careful attention to avoid peritoneal injury has greatly reduced this hazard (12). With the Coffey I method, however, any one anastomosis is completed at one stage and does not have to be dissected and handled again. Manipulation tends to decrease blood supply and increase the possibility of soiling. As will be noted later, deficient blood supply underlies many failures. Abscess formation is not due to the inevitable slight soiling (which the peritoneum readily overcomes) but rather to sloughs, massive soiling, and the leaving of an open fistulous communication with the peritoneal cavity.

No foreign bodies remain in the lumen of the urinary tract. Catheters increase the hazard of

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Fig. 1. Autopsy specimen of a patient who died 44 days after the operation. The specimen shows the bladder and the ureter, which were anastomosed. The patient had a history of bladder cancer and had undergone a partial cystectomy. The specimen is shown in the figure to illustrate the results of the operation.

infection. They may become pigmented due to the staining of their aim of producing good drainage. Furthermore, they may compromise the blood supply of the ureter and lead to sloughing with subsequent leakage. The Coffey II method (2) is the classic example of ureterostomy with the use of catheters. McCann (14) and G. G. Smith (15) strongly favored the results of the Coffey I over the II method after trying both operations. The experimental use of small ureter tubes in the anastomosis to insure patency was not successful largely due to calculus formation. (16) Any permanent foreign body in the urinary tract greatly increases the hazard of stone formation and intractable active infection. However, a fairly adequate urinary output per rectum should be obtained. Other factors permitting a plan which accomplishes this with the best ultimate result are the least risk and the minimum number of operations; the procedure of choice. In this series both ureters were transplanted in one operation, 3 times in all of these cases within a week, recovered within 6 hours and the majority had urine in the rectum at the end of the procedure. Those who had spinal anesthesia had less delay than those who had general anesthesia. In the nine series of 9 cases all upper tracts which functioned preoperatively continued to function in the immediate postoperative period.

Two upper tracts which had no function before transplanted regained good function after the operation. Theoretically, the Coffey III method and some of the two-stage methods might produce renal damage before the transplants functioned adequately. Practically, however, they appear to be absent or insignificant.

The wide area of contact afforded the ureter and bowel by the 1 1/2 inch wide submucosal strip provides adequate adherence to prevent leakage, allows for some collateral circulation between the two organs to lessen the possibility of infarction, and promotes adhesions which should take tension away from the site of critical union. This is true of all methods utilizing Coffey's main principles. Coffey's operation is Hynes, Jewett's, Hinman's, Foley's, and others. It is not true of the Maydl and Bergenhem (4, 13) operations and while some beautiful results have been obtained by these operations, they have been generally unreliable and are no longer used. All of the Maydl and Bergenhem operations are unsuitable in a program for bladder cancer since a portion of bladder remains attached to the ureter.

The valve action for which Coffey devised the submucosal strip is an additional advantage, but the presence or absence of the valve action cannot always be correlated with the clinical results. If a patient lives 44 years and 8 months after operation works regularly and raises a family, his transplantations are certainly a clinical success. Autopsy was obtained on such a patient but no valve action could be demonstrated (Fig. 2). The perat Fowler (20) attempted to obtain valve action by attaching both ureters to the upper surface of a tongue of submucosa which would be pulled upward by bowel content and thus occlude the ureters. This method did not work, provided a wide area of contact between the ureters and the bowel, and it is probable that the valve mechanism had only recently given way. All of the patient's problems were solved before death.

With the Coffey I operation no special constructed instruments are necessary; the usual laparotomy select incision is sufficient. The instruments devised by Hinman (8) and Foley (3) apparently did not become popular. Jewett's special electrotonic (17) is the best known device for current use. As for the special skill or knowledge needed for proper use of the instrument itself, it is obtainable. I kept in good condition for 15 years. Finally, experience with the minor importance cannot be overestimated. Special instrument

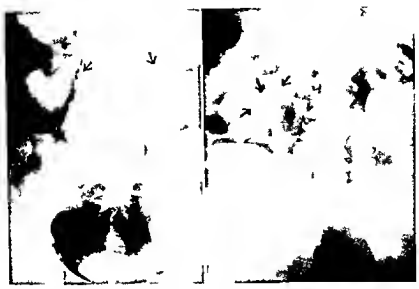


Fig 1. Left: pyloric anastomosis. Right: distal ileal anastomosis. 37 347

sometimes show a tendency to multiply themselves for example into sets of varying caliber and varying curvatures. Again a method using special instruments should show clearly superior results to the simple direct Coffey I to warrant the expense extra training and trouble in obtaining and using that tool.

Ureter ligation should be avoided as it may interfere with blood supply as well as urinary drainage. Any portion of the bowel from the descending colon to the rectum can be used. The bowel may be mobilized if necessary. There is however less latitude on the right side than on the left and hence a greater length of ureter is necessary on the right to permit a nonanastomosed course. The right side was always transplanted first in this series.

Absence of ureteral tension is an important factor in success is readily accomplished by the Coffey I method. Tension decreases ureteral blood supply and tends to make the anastomosis sutures cut through. The operator should be reminded that traction on the ureter during dissection temporarily lessens it. Some excess length must also be allowed for mobilization of the ureter. Lack of relaxation between the ileostomy and the anastomosis is we believe one of the common causes of failure.

Relaxation is obtained by tacking a flap of parietal peritoneum over the anastomosis. Further intestinal alteration

but gross displacements of the bowel which could pull or angulate the ureter are prevented. In



Fig 3. Left: distal ileal anastomosis. Right: distal ileal anastomosis. 37 34

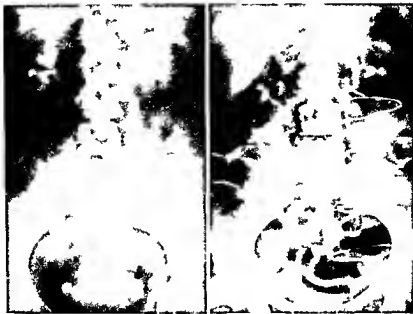


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In both these cases leakage occurred after at least 1 week. This fact suggests that the ureter had sloughed. The operative and autopsy findings indicate the same. Probably the commonest cause of leakage is failure of blood supply to the ureter leading to slough. Of course actually leaving an open communication with the peritoneum at operation will allow leakage but any method which does this with regularity will be abandoned abruptly. Also if such does occur the signs of leakage should on the average appear much earlier than in our instances. If the ureter is said to have sloughed, the failure of blood supply seems obvious but if the ureter is said to have pulled out the idea cannot be that traction *per se* was the cause. Sutures cut through by ischemic necrosis. Tension duces ureter blood supply and also pulls on the anastomosis (in effect tightens it). Yet if there is no failure of blood supply we believe sutures will not cut through and healing should proceed. Moreover breaking or untwisting of a chord sutures must be rare. This sloughing out and pulling in out of the ureter are both due to ischemia in the final analysis. Unless infection is very rampant and this necrotic gives reason of the local failure of blood supply is the ultimate cause of sloughing from infection. Also noted before leakage is not due to the contamination occur



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poorly chosen. The second likely would not have
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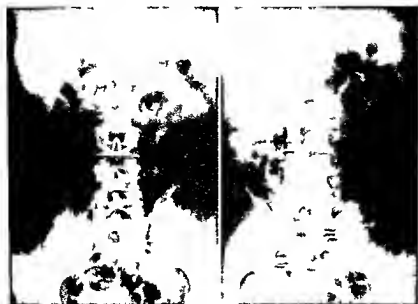
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intra venous pyelogram before operation and 77 days after operation. The 4 patients dying post-operatively had 8 functioning upper tracts even though 2 of these transplants leaked as discussed previously. After the original discharge the kidneys became nonfunctioning as judged by intravenous pyelogram and a nephrectomy was performed on another. The history indicates that one other patient died of renal failure 9 months after discharge. These last 3 cases and several that showed a definite improvement in function are outlined in the following.



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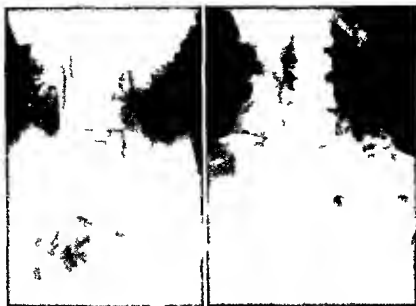
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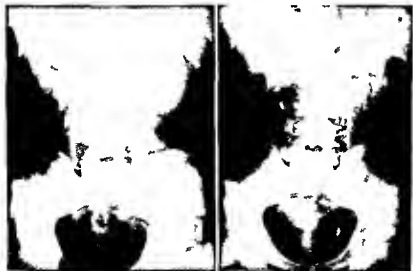
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result thou h we are n t (Case N Y H No
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The long term outc me of the perati re
gard enal function cannot be foret l f om
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many pyelogram a few m nth after operation
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ha e been due to ca ce Thu of th t patients
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304) nd l of phl b t (her reported)

M F N Y H N 394 88. f 3 re l d f l had
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ssel bea us both pla ed
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C ce m f re l l necessary t eat h
h f t em a and tan af h sec l of t
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t ght t rs MF \ \ H \ 394 885



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l ft mp d)

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f ppea d O dm blood t g rum p tu d m bl Th go f th right t rs
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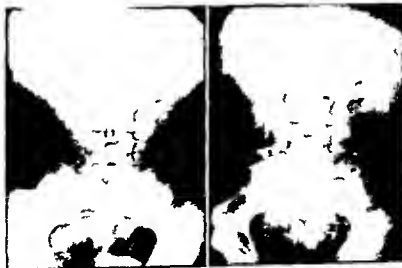
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lowing:

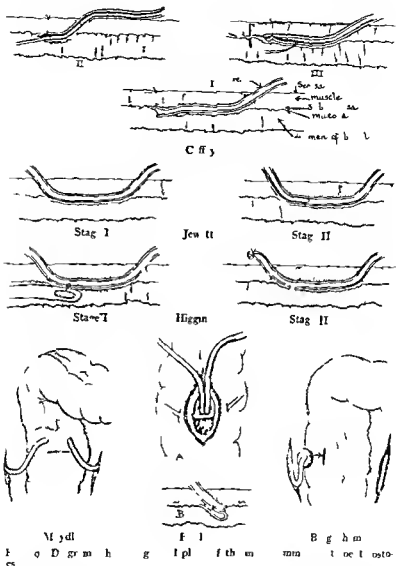
A complete diagnosis and general evaluation was always made. Intravenous pyelography usually sufficed but repeated or retrograde studies were made when necessary to a clear diagnosis in the status of the upper tracts. A barium enema value perhaps not essential always has been of value. It allows the patient to plan his method of procedure. In at least 1 instance ureteral transplantation was contraindicated because of extreme diverticulosis plus signs of bowel infection. If bowel symptoms should appear after ureteroenterotomy the known preoperative condition of the organ would be most advantageous. The function capacity of the anal sphincter should be determined. Usually the history and digital examination are sufficient but if in doubt testing by enemas is order.

Bilateral simultaneous transplantation did not whenever feasible. Twenty-three (59 per cent) of the 39 cases were done with 2 deaths, a mortality of 8.7 per cent compared to 12.4 per cent mortality in the 16 done in separate operations. This difference is not significant because a chance of only 1 mortality in the second of the first two would make these items significant (6.2 per cent respectively). No complications were attributed to the surgical plan.

Preoperative preparation of the bowel is most important. The usual regimen is 5 to 6 days on 8 to 10 grams sulfasuxidine daily, enema every



F 6 P eopera t f d post pera ht p y l stram ll ra
f t n p y lograph es l \ \ H \ 3 4 3



the tension on suture in which is merely approximating and partially immobilizing the site of transplant. The ureter becomes temporarily lengthened during dissection and the bowel is often displaced from its natural local facts to be borne constantly in mind. We insert the first suture line and the site of the anchoring suture with a second line of interrupted fine silk sutures. Special care must be taken that the upper end of the anastomosis is not closed tightly about the ureter by making the suture lines too long.

We have not hesitated to transplant dilated ureters. None of the ureters in this series were

more than one centimeter in diameter. Several were one centimeter in diameter. We have the impression that ureters with moderately dilated ureters are somewhat better. Probably the retroperitoneal blood supply is large and the size allows for shrinkage and fibrosis, etc., ultimately a good caliber.

After operation a large rectal tube is kept in place constantly for five or six days. The tube is changed twice daily and most often if not draining. Chamberlain is not insured. Also because a high postoperative drainage. This decompression relieves pressure

TABLE I—ANALYSIS OF 39 PATIENTS WITH COFFEY I TRANSPLANTS

	N	P
Indicated patient	34	
Centrifugal		
Female		
Male		
Age		
Oldest—76	4	
Deceased		
Discharge		
Death		
Complications		
Follow-up		
Obstruction		
Pharynx		
Trachea		
Wound		
Obstruction		
Pharynx		
Trachea		
Wound		

TABLE II—ANALYSIS OF 79 COFFEY I TRANSPLANTS

	P	ts P
Ureter	9	
Male	75	
Female	77	
Age	69	
Oldest	4	
Deceased		
Discharge		
Death		
Complications		
Follow-up		
Obstruction		
Pharynx		
Trachea		
Wound		
Obstruction		
Pharynx		
Trachea		
Wound		

SUMMARY

The Coffey I operation for ureterosigmoidostomy has the following good characteristics: it is relatively simple and follows a fundamental principle; directly no extraordinary surgical skill is needed; no special instruments are required; no foreign bodies remain in the urinary tract; immediate urinary output can be expected; clear visualization of all steps may be obtained; the ureter and bowel adhere well; tension and angulation are a variable relative immobility; it is possible and early results are completed at one stage; and the early results are fairly satisfactory compared favorably with results obtained by other methods.

Our results with 39 consecutive patients are indicated (Tables I and II). The operative mortality from all causes was 10.2 per cent; the mortality due to local failure of the operation however was 5.1 per cent. The nonfatal hospital complication rate was 12.8 per cent. Seventy-seven per cent of the patients had a satisfactory postoperative course in the hospital. Preoperatively by intravenous pyelography there were 73 functioning upper tracts; postoperatively in the hospital 77 functioned. At this writing 3 to 4 months after operation 4 patients (61 per cent) are still alive and have 44 functioning upper urinary tracts.

A total hospital complication rate of 3 per cent fatal and nonfatal is too high especially in view of the fact that the procedure is so often a preliminary to further drastic therapy. However the desperate plight of most of the candidates

Patient	35
Female	3
Age	
Oldest	
Deceased	
Discharge	
Death	
Complications	
Follow-up	
Obstruction	
Pharynx	
Trachea	
Wound	
Obstruction	
Pharynx	
Trachea	
Wound	

Blood	7
Blood	
Complications	
Follow-up	
Obstruction	
Pharynx	
Trachea	
Wound	
Obstruction	
Pharynx	
Trachea	
Wound	

on the suture line promotes output and decreases possible mild rectal reabsorption. Enemas and irrigations are contraindicated since they increase intracolonic pressure. Relatively mild cathartics indicated about the 10th day. A low residue diet is continued for weeks. Sulfadiazine 0.5 grams 4 times a day is given for about 2 weeks to find a bacteriostatic quality to the urine. Usually a low steen gastric drainage is started immediately after operation and used intermittently for 2 or 3 days. This procedure prevents distention in which we formerly troubled in many cases before its use. Finally an intravenous pyelogram is made to check the result.

provides considerable justification. The symptomatic relief is often sufficient indication.

We have attempted to limit discussion to ureterostomy itself and purposely avoided discussions of treatment of bladder cancer, ectrophia, fistula, etc. If ureteral transplantation to the bowel were a benign highly successful procedure it no doubt would be very widely used.

These operations were performed in the years 1941 to 1944 inclusive by the operator using essentially the same technique, the Coffey operation. Only one of the operators had had previous experience with ureteroenterostomy. The surgeons were at the New York Hospital, Stebens, A. McLellan, Drew, Whitmore, Gardner, and Marshall, at the Memorial Hospital, Twombly, and Marshall. None of these case records except the one by Coffey's method (c) has been previously reported.

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- 3 F. F. L. B. S. g. ry. 93 8 2
4 F. L. G. S. Am. J. S. 93 1
F. L. G. S. Am. J. M. S. 93 1
6 H. C. C. J. L. l. B. l. t. 914 3 0 90
H. F. l. pl. d. l. ra. f. l. l. ra. f. l. l. ra. C
99-99 f. h. l. ad. f. h. l. l. W. b. S. a. l. r. C
8 Id. m. S. Gyn. Ob. t. 93 64 9 0
9 H. m. F. d. S. m. t. h. D. S. 93 6
H. m. F. d. W. H. M. J. T. Am.
A. G. t. S. geo. 93 6 0 6
J. T. H. J. J. L. l. B. l. t. 94 4 8 4 8 0 0
2 H. d. 944 5 3 6
3 M. A. W. ed. W. sch. 94 44 0 1 1
4 McC. R. J. A. J. L. l. B. l. t. 94 4 4
A. R. M. Am. J. S. 93 1 1 1 1
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3 Id. m. T. Am. Ass. G. t. geo. 93 3
9 S. E. T. A. R. S. g. Gyn. Ob. t. 96 23 9
2 Id. m. J. U. l. B. l. t. 94 46 5 60
2 S. T. A. R. d. L. J. W. J. J. U. l. B. l. t.
943 5 4 0

SURGERY OF THE MANDIBLE THE AMELOBLASTOMA

LOUIS T BYARS M D I A C S a d BERNARD G SARAT M D St Louis Misso

THE amel blastoma develops from the cell of the enamel organ during a particular phase of tooth development. It is found most frequently in the mandible less in the maxilla and occasionally in the pituitary gland tibia ulna and ovary. For the purposes of this report only the ameloblastoma of the mandible will be considered. Although this tumor is considered to be uncommon there have been over 400 reported (1, 2, 3, 6). Both sexes are affected in about equal frequency. The ameloblastoma has been recognized at birth and as late as the twenty sixth year the average age in Robinson's series was 37.6 years (6).

The ameloblastoma is generally described as a benign neoplasm although in a study of 39 tumors 45 percent showed metastases or histological evidence of malignancy (6). A better known characteristic of this tumor is its persistence and tendency to recur after operative treatment. The tendency for the ameloblastoma to recur locally is probably due to inadequate surgical treatment. The purpose of this report is to consider (1) the surgical treatment of ameloblastoma of the mandible and (2) the reconstructive measures subsequently.

BRIEF SUMMARY OF DENTAL HISTOGENESIS

A brief review of dental histogenesis will facilitate understanding the origin not only of the ameloblastoma but also of other dental anomalies. (Table I) Tooth development may be divided into three stages: (1) growth (2) calcification and (3) eruption. For the purpose of this report only the first stage (growth) will be considered. This stage can be further subdivided into (a) initiation (b) proliferation (c) differentiation and (d) apposition (Fig. 1).

Initiation. Between the sixth and seventh weeks of intrauterine life and proliferation of the oral epithelium begins (Fig. 1a). The dental anlage develops. If initiation does not occur there will be no tooth development and anodontia will be the clinical condition (2).

Proliferation. Cellular proliferation continues until an invagination takes place and the connective tissue which borders the invagination of the epithelium condenses to form the dental

papilla. **Dentin.** The primordium of the dentin and pulp (Fig. 1b). During this period the early form of the odontome arises.

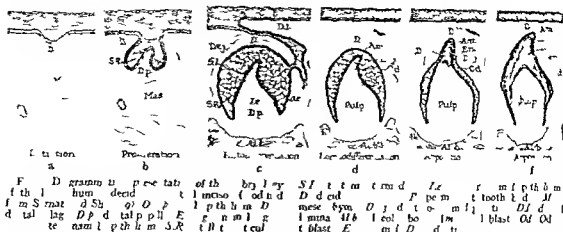
Differentiation. The enamel organ. The invagination which originates from the invaginated epithelium gives rise to the outer enamel epithelium, the stellate reticulum, SR, the stratum intermedium, SI, and the inner enamel epithelium, IE (Fig. 1c). It is during this period that the ameloblastoma arises from the enamel organ. This occurs within the first few years of life although no activity may become manifest until some years later. Enamel is never found in this tumor. If tooth development continues normally however the inner enamel epithelium will differentiate into ameloblasts the enamel forming cells. Thus one can readily see that ameloblastoma is not the correct term because the tumor arises from the enamel organ before the ameloblasts have differentiated. The term preameloblastoma is more accurate.

In addition the odontoblasts differentiate from the adjacent connective tissue of the dental papilla. The dentinoenamel junction which forms the basic pattern of the tooth is determined between the inner enamel epithelium and the adjacent connective tissue of the dental papilla (Fig. 1d). It is during this period that the Hutchinsonian incisive and mulberry molar develop (9).

Apposition. **Formation of enamel.** In this stage a cup of dentin is formed and with this stimulus the preameloblasts change to functioning ameloblasts and a corresponding amount of enamel is formed on the opposite side of the dentinoenamel junction (Fig. 1e). When this formation has been initiated there is a synchronous recession of the odontoblasts and ameloblasts from each other. Incremental layers of enamel are apposed one on top of the other until the cusp is fully formed. Subsequent layers are apposed at the sides until the crown is complete (Fig. 1f). Systemic disease during this period sometimes affects enamel formation (7, 8). After formation of enamel has ceased formation of dentin continues to complete the root.

DICUSIO

Clinical findings. The ameloblastoma which is most frequently seen in young adults is characterized by a slow progressive swelling of the jaw usually near the angle. The tumor sometimes at



tains large proportions (Figs. 3 and 4) it tends toward the clavicle and weighs several pounds. The growth may be accompanied by pain. There is usually a history of a tooth or teeth having been extracted from the area several years previously and of several attempts surgically to eliminate the tumor. Fistulous tracts leading to the oral cavity and secondary infection of the tumor are not uncommon.

The buccal plate of bone is usually expanded most although the lingual bone may be expanded to push the tongue to the opposite side of the mouth. The bone is sometimes so thin that it will crack like an eggshell. These are late findings after the tumor has changed from the solid to the cystic phase. The patient may be seen only after pathologic fracture has occurred. Only occasionally do true signs of malignancy appear.

Roentgen graphic finding The roent enogram serves as a valuable adjunct in the diagnosis of the lesions of the jaw but the final diagnosis depends on the roent enogram and particularly the microscopic examination The roent enogram is most valuable for the early diagnosis of ameloblastomas of the jaw when the tumor is still centrally located has not expanded the bone and is in the solid phase It is at this time when most of the mandible is yet not destroyed that the tumor can be removed completely with no further deformity resulting to the patient When the ameloblastoma has become cystic and considerable intrathoracic findings are obvious the roent enogram of primary value in showing the extent of bony destruction (Figs 3 and 4) The constant characteristic roent enographic description of the ameloblastoma is The multilocular appearance and the scalloped border between the bone and the tumor The ameloblastoma

giant cell tumor carcinoma and the lesions which are destructive cannot be positively differentiated from each other on the roentgenogram (2).

Gross findings: The findings on gross examination vary with the stage of development of the ameloblastoma. Analysis of 219 cases revealed that 37.9 percent were cystic, 24 percent were both cystic and solid and 19.1 percent were solid. (6) This classification is arbitrary and combinations of the solid and cystic tumors are found in varying degrees. The solid tumors which usually represent an earlier stage in development, if fine granular consistency and encapsulated. The cyst may be one principal mass with numerous smaller daughter areas. The cystic type usually represents the solid tumor after cystic degeneration (Fig. 4c). The contained fluid may be clear, yellow to red and either of a mucous or serous consistency. The bone is expanded and may be parchment thin (Fig. 4b).

Microscopic findings in the ameloblastoma: factored by an understanding of the histology of the connective tissue (F. 2) Thomas states there are many variations due to the site of different types of epithelium may obtain when the tumor formation be on the behavior of the structure and the malignant changes which may develop (The behavior of the connective tissue) (F. 3) The histology of the connective tissue does occur (F. 4)

Simmons states that while the cuboidal telodermis predominates in the growth of the malignant than in the cystic type with the development of melon-like cells. Schwartz and Barnhill believe that there is no apparent relationship between the histologic pattern of the melanoblastoma and its ability to metastasize.



Fig 1 ft Ph t gr ph tak My 943 f bl st m as finally m d P t t t ld t th t m
 p t t th l g m l l tom f th ht d f th that th p tat ld be th th d d
 m d bl f R hat m l ged 43 y w f tse by t l d t g h m d f g t b t t Wh th p t t
 My 943 S ll w nrt t d n s d ht d y 943 h h d be bl t w k f th p t t
 f m th 05 T l m t d t g w d p t t y Ah m t f th m d bl d My
 had t l t the el l tra l p t l 938 th 943 H h k d h y f th pe
 ht d f th j dd nly h g t ll d t that t d ha j d g od h lth b Post p t ph to
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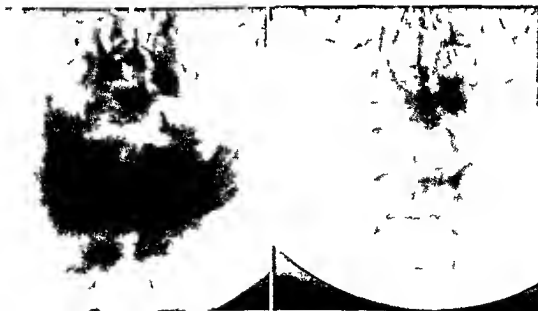


Fig 3 Rox tce gr m f sam t t as Fig 4 f j d f b P t t t ft t f ght
 a. f l f reope t N t th l g th ght d h f f d l l

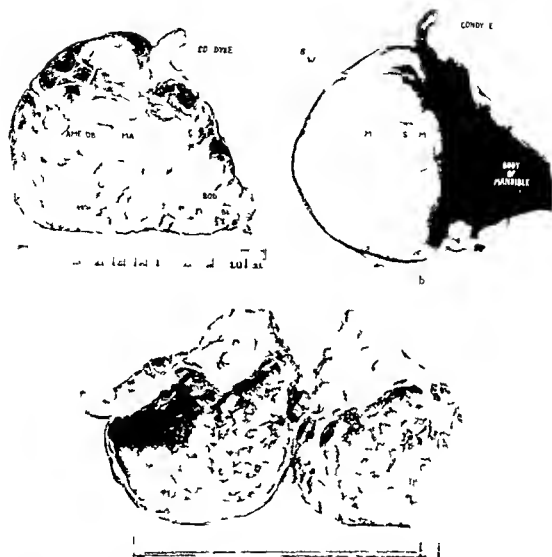


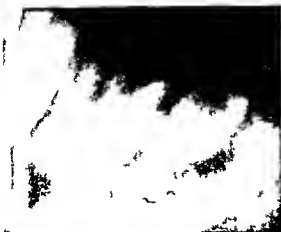
FIG. 4. Photograph of the specimen of the tumor and mandible which were resected. The tumor is of the type of fibro-osteoma of the mandible.

The specimen of the tumor and mandible is shown in the photograph. The tumor is of the type of fibro-osteoma of the mandible.

SURGICAL TREATMENT

Inasmuch as radiation does not affect the am loblastoma mater, the treatment of this tumor of the jaw is primarily surgical. Both the surgical approach and the procedure which is carried out depend not only upon the diagnosis of the type of tumor but also upon its extent. In some instances the extent of the tumor will be such as to determine the type of surgical ap-

proach. In other cases it is still necessary to know the type of tumor with which one is dealing and to determine subsequently the surgical approach and procedure on the basis of the clinical examination and the roentgenographic studies. Sometimes it may be desirable to make the diagnosis before the surgical procedure. In some cases it is still not certain whether the tumor is of the type of fibro-osteoma or of the type of fibro-sarcoma. In such cases it is necessary to examine both preoperatively and postoperatively.



b



d

Fr s Lat l oe tg g m f th m d bl b
h g d ff t h t n t f th l bl t

With gh f these f h p l t be
C A M by C) sc p t (J C tes)

In the latter group either preliminary or examination of a frozen section at the time of operation is of advantage. An accurate microscopic diagnosis will give the operator courage to do a radical operation if necessary and will give him confidence in the less radical procedure. However, it has not been our practice routinely to do a resection of the jaw in dealing with the ameloblastoma. The more accessible lesions are first removed locally. The patient is warned that repeated postoperative examinations will be necessary over a long period of time to discover possible extension of the tumor. In many instances the local excision is adequate and in definite remission. In other instances (1) where the large portion of the mandible is involved (2) where the tumor has definitely invaded beyond the confines of the bone or (3) where inaccessible areas of the mandible are

involved so that local excision could not be adequate resection of the mandible, the primary treatment of choice (Figs 2 and 3). Sometimes the choice of whether to do a local excision or radical resection must be made only after surgical exposure of the area of involvement. Especially is this true where the surgical approach is from the outside through the neck. In almost every instance where the surgical approach is from the inside of the mouth local removal is done.

Indication for local removal. Having made the decision to do a conservative local removal rather than a resection of the mandible, adequate exposure must be gained by incising overlying soft tissues and attached mucoperiosteum over the complete extent of the tumor. Following this, overlying bone should be removed adequately so as to give a complete exposure of the underlying tumor and



F. 6 Ph t m g ph f m l e n t m i b l a s t m
(f t h j w) h i h t a l l y m t a t a z e d f t h l g s

to permit partial obliteration of the cavity which results from the removal of the tumor. This obliteration is accomplished by collapse of soft tissue into the cavity. It is preferable not to rupture the capsule of the tumor itself during the operation. In many instances of the less loculated type of tumor the growth may be removed completely and without pills. Under the circumstances there is less possibility of continued growth of the tumor.

Many of the multilocular tumors have irregular outlines and crevices in the bone at which point the tumor is usually broken into during the process of removal. One should never start out to do a curettage removal of the type of growth

N t h h a t r i t u r r e m t f t h t l t e l
with poorly defined cystic plasma bodies. These re-
duced by collagen which is hyaline in texture.
d t p o s s e s t h r e u l r a e m t l l t r e d
t h m l l y g r g t y p e f l b l t t h
p t h l m e d e g u l g p r r l e d h
d e c o l l a p e t m h h t d t f p o e
h a e m t m h r a (S e p t b e 6 0 4)
O l e d f m l e d j r s t r e s e e
M y 3 9 8 i h t h p l t f l l f l t d f
f f y A d e m f a m l b l t m d j
t a s m e d t h r o h t r a l p p o a h t h r e
s e c t f t h m d i b l i t t t m e d o j h
e r t l l g f d b l l e s p e t e d p e
R d m w b e q u t l y m p l t d (j g h o u r s
N o d l e s s o o p p e d l g b t d f h d l
t l l y l e d t h t f t d f h e a l l t t
h e a t m t b l o o d 0 3 9 d t f i h h e s t
p l t e a l e d m l u p l o d l e s b o t h l g t h d N
p y a s p e f r m d 0 4 d h l l o m t l
f t h t u m t h l g s r e l d i t b e m r p h l g a l l
d t u c a l w i t h t u m r s p e r a t p e c i m ()

It is much better to attempt total enucleation where possible. In multilocular or more invasive tumors one can become involved in a piecemeal removal of the tumor however and a certain amount of curettage will be necessary. Under the circumstances it is obvious that small fragments of growth will be left behind and necessitate removal at a later date.

To prevent this difficulty cautery at one of the cavity has been recommended. This cauterization may be either chemical or thermal. In general the criticism of chemical cauterization is that one cannot accurately determine the depth of penetration of the chemical so that cauterization tends to be either too great or too little in extent. The



BONE GRAFT

F l f t l a t r a l r o e t g e o r a m f m d i b l a f t
subperiosteal section showing method by which post-
t f m d i b l a f r a g m e n t s c a b e m a i n t a i n e d p r i t
e f b o g r a f t A t a i n l e s e e l b w a s i n s e r t e d
t h r h d l l h l e s t h b o l t h a s b e e p e e
f S m t h s h u n d h a s h e a l e d a n d b o y n u h a

occurred. I t h t a t a i l e s e e l b a
r u d e d a f y e r s h p p r a m b l a l e
g e o r a m f t h m a d i b l f t e e c t a b a z a t f
m a d i b l a f r a g m e n t s d i n s e r t i f b o g r a f t t h o f
p o s t d f t h j w h b e e e d o c l e
t a h e d p l t i s h l d n t h p o s r i f g m p o s

TABLE I—STAGES OF TOOTH DEVELOPMENT DURING WHICH CERTAIN DENTAL ANOMALIES FIRST APPEAR

Stages of tooth development	Period	Dental abnormality
I G	th	
I t t		Adont
b P l f t		Od t
D f f t t		
H t o d f t t		P m l l l m
		(A l b l t m)
M p h d f t t		H t h
		M m l
d Appo t		Ch l g l t l
		(I m l h y p l t)
II C l heat		F l
III E p t		I d o d t

TABLE II—HISTOLOGIC CLASSIFICATION OF THE AMELOBLASTOMA (12)

Type of	Classification
m l f l t	Ch f h a t n i
Ep t h l m	L t l d f t t f p h t
	h h g c d t d
St l t	F p t h l l l t l t h p e g
	h t t d f l l
3 Am l b l t	C y l i l l (p m l b l t) b g
	f l l e s
4 Aca t h m	St l l t c u l m d f f t t t
	s q m p k l l l p t h a l
	p e l f r m t
5 Ca c i m	s q m l l

extent to which penetration goes and destruction is brought about with the thermal agent is better regulated than with the chemical. If the ameloblastoma has not been removed completely it has been our practice to use the electro-surgical unit or Boy's knife with the coagulating current and to go over the exposed bone surface. Heavier cauterization is done in areas of greater contamination with tumor tissue. The disadvantage of this procedure is that a certain amount of bone will be devitalized and sequestration will occur. In the meantime the presence of the devitalized bone will delay healing. However, if the tumor and its immediate bony confines have been completely removed, a destroyed cure is almost sure to result.

External approach. The external approach for both resection of the mandible and for local excision of the growth is the same. The incision should parallel the natural fold in the skin of the neck. It should be made underneath the mandible and should be adequate in extent to give complete exposure. The course of the facial vein, branch of the facial nerve in the neck, should be remembered. The nerve can be preserved if the approach is carefully planned. The incision should be marked on the skin with the head in a normal position and should be 2 centimeters below the angle of the mandible. A flap containing skin, subcutan-

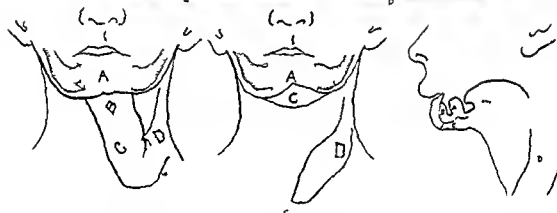
TABLE III—VARIOUS APPLIANCES USED TO CONTROL FRAGMENTS OF MANDIBLE AFTER RESECTION

I	
Appl	h h t t teeth (t l) p t
	f m t t s t t h
I t d t t	es
b A h b	
S w g d m t a l p l t t	th t j k s c)
d S p l t	i h t h d p e d t p t i t g b
II	
Appl	h h t l b l t t h (t l) l
	h h t d t t p t f g t
W t t h	o c l p t m d l g p d
n m l	t k p p o t f g t d
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III

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	E t r a l (p f e d)
b K u s c h	(m o d f d) p d t h g h f g m t
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d O p	b i p h t t h d t h c u f t l
	A l o d l f b o m f b e c f f l o c s e m j o f d b o
	m a d b o e t f b t f p l

eous tissue and platysma is then elevated. This includes the lower pole of the parotid gland and soft tissues anterior to it. Unless the lower pole of the parotid is elevated with this tissue the facial nerve must inevitably be severed. The entire ramus, as well as the angle and most of the body, may be thus exposed. Having exposed the area of the tumor, removal may be done in one of three ways. The procedure of local removal by shell is not the tumor, and applying the cauterizing agent may be followed in certain cases. In other instances it is possible to do a partial block resection of the mandible. The Albee saw is used to remove the tumor and containing block of bone. But a bridge of bone is left to maintain the continuity of the mandible. This is rarely feasible. The third method is to resect the mandible (Figs. 2 and 3).



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The site of resection of the mandible is usually been determined before and has been studied in the roentgenogram. It possible some portion of periosteum is left intact to bind the flap. All bleeding is controlled. Where possible, myofascia is sutured so as to be seen off the mouth from the neck portion of the wound thus avoid any less contamination. The neck wound is closed carefully with drain inserted.

Myofascia flap Wherever resection is done, myofascia must be made to maintain the remaining fragment of the mandible in a near proper position as possible prior to bone graft repair (Table III). If there has been dis-

articulation in removal of the amputated then the anterior fragment must be considered and in this case the simplest and best method of maintaining position is to wire the remaining teeth occlusion until complete soft tissue healing has taken place. This same procedure may be the simplest all when there are teeth on both the anterior and posterior fragment. However if the resection has been at the angle of the jaw so that the angle and ramus remain as the posterior segment some means must be taken to maintain contact with the piece between fragments but all the posterior fragment is in proper position. (Fig. 1) Various methods have been used to control the



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posterior fragment (T ble III) It is essential that this space retention be maintained until the bone is complete soft tissue healing. Otherwise as soft tissue healing occurs there will be progressive displacement of the fragments by the pull of the new formation scar tissue and the various muscles. This displacement will interfere with later repair by bone graft. This condition is especially common where mucosa has been removed and a granulation bed has been left inside the mouth to heal by secondary intention.

Reconstruction of the defect. Many patients have apparently been content to continue with what has been the defect in the mandible repaired. In some instances it has been possible for them to wear dentures. Unquestionably the patient is more comfortable and his situation is more normal if a repair of the resected area of the mandible can be obtained with bony union. A number of methods may be employed but in general the free bone graft is the most desirable procedure.

In order to carry out the procedure of a free bone graft satisfactorily, certain things are necessary. The fragments of the mandible which remain must be free enough so that they can be not only placed but also maintained in their proper position during the time that the bone graft is being in place (Fig. 7b). It is extremely important that the contour of the bone be adequate in quality and amount to give good contour

and nourishment to a bone graft. If the overlying tissue has been damaged to the point that it is scarred and tight, the graft is likely to be extruded. If it is necessary to dissect dense scar tissue from between the ends of the bone before they can be restored to their proper position then this must be done prior to the insertion of the bone graft to prevent mouth contamination. In certain instances it may even be necessary to apply additional soft tissue by means of flaps (Fig. 8) to replace scar or to supplement inadequate covering material which is present. This is done prior to the insertion of the bone graft. This is well illustrated in one patient (Fig. 8) who had lost two bone grafts because they were placed in dense scar tissue.

The bone graft may be either massive, using the half or full thickness of the rib or a section of the ileum, or it may be thin, as in the case of the osteoplastic graft taken from the tibia. This type of graft may be applied in several thicknesses. Regardless of the type of graft used, it is desirable to overlap the ends of the mandible with an inch or so of the bone graft. Here possible making the bone graft two inches longer than the defect. In some instances the portion of the graft which overlaps the ends of the mandible may be thin while the portion between the ends is thicker. Sometimes a T-shaped graft may be employed, the thick arm of the T projecting in between the

end of the mandible. In all instances the bone grafts should be in as close contact with the mandible as possible and anchored to soft tissues or even to the bone itself with silk or fine tantalum wire sutures.

Where there has been a disarticulation of one side of the mandible a rib graft containing cartilage and bone can be utilized. The cartilage end can be fitted into the temporomandibular fossa and the bony end attached to the remaining mandible (Fig. 9).

SUMMARY AND CONCLUSIONS

The ameloblastoma arises from the enamel organ during a particular phase of tooth development, namely morphodifferentiation. Because the cells from which this tumor arises are not yet differentiated into ameloblasts the term *pre-ameloblastoma* is more accurate.

This tumor is found most frequently near the angle of the mandible in young adults. Although the clinical history and roentgenographic findings are an aid the final diagnosis depends upon microscopic examination.

It is slow growing and unless completely removed will continue to grow (rather than recur). The ameloblastoma seldom becomes truly malignant.

Curettage and cauterization with drugs and radiation are inadequate therapeutic measures. The lesion should be (1) completely enucleated if unilocular (2) cauterized by heat if not too large and multilocular or (3) if extensive resected including a small amount of normal bone. The cure is the best method of treatment because they give the greatest assurance of no tumor being left.

The surgical approach and procedure for various ameloblastomas and the necessary subsequent reconstruction surgery have been considered.

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BIOLOGIC INVESTIGATIONS OF A NEW ABSORBABLE SPONGE

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RECENT reports on fibrin foam (4, 9) and oxidized cellulose (2, 3, 7) indicated that a material with the properties of a sponge that could be absorbed by the animal body might have utility in the general practice of surgery.

In a preliminary paper (1) there has been announced the preparation of a water insoluble gelatin base sponge which fulfilled the requirement of an absorbable matrix. The purpose of this communication is to report the details of our investigations pertaining to the biologic uses and tissue responses to this new substance.

The physiologic absorption of catgut has been shown by Jenkins (5) to correlate with its enzymatic digestion *in vitro*. Gelatin sponge was found to digest *in vitro* in pepsin solution. The digest time was influenced by the mode of manufacture to the extent that some specimens digested in 10 minutes while undigested fragments of others persisted after 24 hours. There has been obtained evidence that the sponges which required the longest time to be brought into solution by pepsin *in vivo* also demonstrated prolonged physiologic absorption in living tissues.

Most of the animal and all of the clinical investigations including a recent report in this journal (6) which have been made with gelatin sponge to date have employed material from lots which were standardized such that a 100 milligram cube of sponge was completely digested in 100 cubic centimeters of a 1 per cent solution (0.37 per cent HCl as solute) of USP pepsin at 37 degrees centigrade in 30 minutes or less.

Many different sized molds have been prepared from the foamed gelatin. The tough porous nonbrittle sponge after drying was

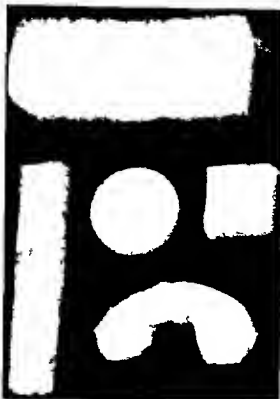
packaged and sterilized in the package by standard dry heat procedure. If autoclaved there resulted a complete loss of the desired physical properties. The final product could be handled with sterile technique and further cut to any desired shape and size (1, 2, 3).

Pledgets were found to wet readily by dipping them in a solution and kneading vigorously in the fingers or sterile gloves for a few seconds. When the damp mass was returned to the solution it rapidly imbibed fluid and assumed its original shape and size. It was our practice to wet sponges in the particular solution which we wished to carry to an implant site.

An experiment designed primarily to ascertain if this slightly denatured protein material would be physiologically absorbed was conducted with 21 albino rats weighing about 300 grams. Sterile precautions were taken. The animal were anesthetized with ether the outer surface of the left hind leg shaved and prepared with an antiseptic solution (mercuric cresin). An incision about 3 millimeters long was made through cutaneous subcutaneous and fascial layers to expose the femoral muscles.

With a blunt instrument the muscle layers were divided and a dampened piece of gelatin sponge (6 by 8 by 8 mm dry) was introduced. Well above the deep implant a silk suture was taken to insure closure of the muscles and mark the site. Silk stitches were used to close the cutaneous wound.

Animals were killed each week and reopened for inspection. At 1 week the discolored sponges could be readily identified. At 2 weeks they had lost much of their original size and appearance. At 3 weeks only a small transparent gelatinous spot could be found at the implant sites. Nothing could be identified 60 days after implantation. In all 21 cases the wound appeared clean and well healed with no evidence of reaction that could be attributed to the sponge.



F. Abbott, Jr., M.D., Thrombin, and
thrombin solution, by cut and
thrombin solution.

The blood clotting enzyme thrombin has been recommended (8) as a useful hemostatic agent. Its clinical utility has been shown (4,9) to be enhanced if the thrombin is applied in an absorbable porous matrix that does not require removal at the time of wound closure. Such a procedure eliminates the danger of reinstating bleeding due to the need of withdrawing a dressing.

To gain information on the possible hemostatic properties of gelatin sponge when used in conjunction with thrombin, studies were made on the control of escaping blood from several artificially provoked bleeding points. In one investigation 6 rats were anesthetized with ether and the livers were exposed. In the left and right lobes of the liver stab wound were made of sufficient severity to produce a free flow. Small pieces of ordinary gauze were packed into the cut in the left lobe. Into those on the right were inserted pledgets

of gelatin sponge which had been wet in a thrombin solution of a potency of 300 units per cubic centimeter. Before insertion the wet sponges had been entirely pre-soaked in sterile gauze or towel so that they held as thrombin solution only about 5 per cent of their potential liquid absorbing capacity.

On the gauze-filled wound, either continued to bleed or hemorrhage started again upon withdrawal of the pack. Only one indicated a control of the hemorrhage. Bleeding from the wound packed with thrombin damp gelatin sponge stopped in 2 minutes or less. The packs were not removed since removal would usually be contraindicated in clinical practice.

Often the sponge pledget that served for hemostasis on the surface of a wound, once there was no overlying pressure appeared bulky because of engorged blood and exudate. After a few moments when the clotting was complete pressure applied gently but firmly to such dressing caused them to lie as thin films. Because of the fibrin now precipitated in the interstices of the matrix there was no further tendency to swell significantly.

Additional data were obtained by cleanly severing the tips of rats' tails and attempting to control the bleeding. Usually ordinary bandages did not stay the flow until considerable blood had been lost. Gelatin sponge damp with thrombin again demonstrated satisfactory control although the tail had to be adequately immobilized or the wound properly dressed to avoid mechanical loss of the pledgets.

Another investigation was designed to study further the hemostatic qualities of gelatin sponge with thrombin and by histologic examination to evaluate more thoroughly the biologic absorbability of the sponge as well as observe any cellular or tissue reaction it might provoke. Also using the same animal and technique the physiologic properties of fibrin foam and a starch sponge were investigated.

Twenty-eight 300 gram rats were anesthetized by intraperitoneal injection of milligrams of cyclopentylmallylbarbituric acid.

Clotting activity as standardized by thrombin laboratory
the following table shows the results of the study.
The following table shows the results of the study.
The following table shows the results of the study.



Fig 1 Thrombin gelatin sponge () implanted



Fig 2 Thrombin gelatin sponge () implanted

(cyclopal) per 100 grams of body weight. Both hind extremities were shaved and the areas painted with an antiseptic solution (mercerin).

Incisions about 5 millimeters long were made through the cutaneous layers in 4 different regions and the underlying muscles were exposed. All implanted pieces measured dry 5 by 8 by 8 millimeters. Those used in conjunction with thrombin were wet in a solution having a potency of 500 unit per cubic centimeter.

In area A the right leg the muscles around the gastrocnemius were parted and a piece of fibrin foam damp with thrombin was introduced. Occasionally a saphenous vein was intentionally ruptured the resulting hemorrhage was controlled by the fibrin foam thrombin pack.

In area B the right thigh femoral muscles were separated and the pieces of starch sponge moist with thrombin implanted. The material made available to us at that time had very little cohesive strength in a wet condition thus difficulty was experienced in making unbroken implants.

In area C the left leg was inserted gelatin foam damp with thrombin. A main vein was often severed to create a bleeding which

the gelatin sponge thrombin combination readily arrested.

In area D the left thigh a piece of gelatin sponge wet with a solution of penicillin which had a potency of 5000 Oxford unit per cubic centimeter was implanted.

Rats were killed at 5 day intervals from the 5th to the 10th postoperative day. The implant areas were visually inspected and specimens fixed in 10 per cent formalin solution. For histologic study the tissues were embedded in paraffin and stained with hematoxylin and eosin. Using this stain on unimplanted fragments the gelatin sponge showed a mesh of purple fibers the fibrin foam a pink and the starch sponge a shade of pink.

The considerable data accumulated will be abstracted to present only the pertinent information and thus avoid being voluminous.

Fibrin foam implants by the 10th postoperative day were dissected as yellowish lumps which when cut in two appeared as heavy walled fibrous capsule containing the original pledgets. These lumps grew progressively smaller the longer the rats were maintained. A little nodule was found in one out of two examined on the 10th postoperative day. Histologic examination of this specimen showed a remnant of foam with evidence of the sur-

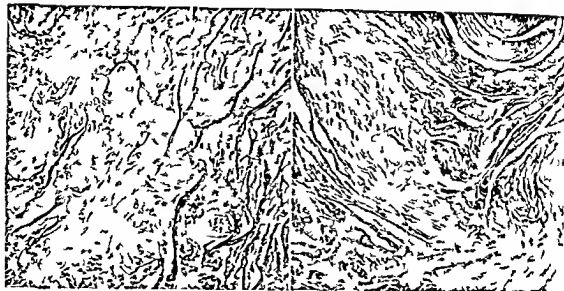


Fig. 4 Photomicrograph showing unabsorbed remnants of gelatin sponge (traced by gelatinous material) after 10 days of implantation in rat muscle.

Fig. 5 Photomicrograph of muscle at 25th day which previously had been implanted 3 days. Little scar tissue distinct.

rounding fibroblastic capsule. Cellular and tissue reactions to fibrin foam were comparable to those to be illustrated for gelatin sponge.

Starch implants could not be identified by gross inspection after the 10th day. However, the prepared stained sections demonstrated pink colored fragments of starch through the 30th day. No significant tissue reaction to this material was observed but the 40 and 50 day specimens revealed an extraordinary cellular infiltration largely of mononuclear phagocytes. The type of phagocyte that usually engulf lipid seemed to be attracted by this material invading and replacing it.

The physiologic response to gelatin sponge whether introduced wet with thrombin or penicillin were the same.

Gelatin sponge implants were observed gradually to become gelatinous and transparent in appearance as they diminished in size. No tendency to encapsulate was noticed. By the 6th day only small transparent films could be found these contained brown red colored areas presumed to be hemoglobin residue from the embedded erythrocyte. Nothing was found by visual inspection after the 6th day and histologic identification of

any unabsorbed material was doubtful after the 25th day.

No untoward tissue reactions were noted in the muscles subjected to gelatin sponge. There was some cellular reaction that was interpreted as being of no greater magnitude than usually arises during the resorption of a naturally occurring blood clot from an uncomplicated wound.

Histologic section of a gelatin implant specimen at the 5th postoperative day (Fig. 1) showed the meshes of the sponge lying close to muscle tissue with very little evidence of cellular reaction. At 10 days (Fig. 3) sponge material was seen as were leucocytes and giant cell. At the 20th day sponge remnants were found along with infiltration of young connective tissue. By the 30th postoperative day (Fig. 5) no sponge was identified by histologic staining; the cellular reaction was subsiding. In our experience cellular response appeared to become maximal in 6 to 12 days then recede.

SUMMARY

A water insoluble gelatin base sponge has been prepared. This matrix was found to be dissolved *in vitro* in peptic solution and *in vivo* to be physiologically absorbed.

In conjunction with thrombin gelatin sponge has been shown to act as a hemostatic agent for hemorrhages that were experimentally provoked in animals.

In additional studies implants of fibrin foam starch sponge and gelatin sponge were enclosed in rat muscle areas. At stated interval the operative sites were reopened visually examined and specimens fixed for histologic study.

The fibrin foam implants were not completely absorbed as indicated by histologic evidence by the 100th postoperative day. There was evidence of fibrous encapsulation of this material. No significant tissue reaction was observed. Cellular response was comparable to that observed in the gelatin sponge implants.

No starch sponge could be visually identified after the 10th day but histologic evidence indicated unabsorbed fragments through the 50th day. This substance excited considerable cellular response particularly of the mononuclear phagocytes.

Gelatin sponges were soaked in penicillin solution and inserted in wounds. The absorb-

sorbed as readily as other gelatin sponge implants with similar physiologic responses.

Thrombin damp gelatin implants were absorbed by the 30th postoperative day as illustrated by the histologic data. There appeared to be no tendency for this material to encapsulate. No tissue reaction was observed. The gelatin sponge pledgets provoked a cellular infiltration which was considered to be no greater than occurs upon the resorption of an ordinary blood clot. The cellular reactions were found in these experiments to become maximal in 10 to 15 days and then recede.

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EDITORIAL

SURGERY Gynecology and Obstetrics

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SUMNER L. HOCH MICHAEL L. MASO

DONALD C. BALOUR 45 at Edt 1 St ff

NOVEMBER, 1945

THE VALUE OF GASTROSCOPY IN THE DIFFERENTIAL DIAGNOSIS OF ULCER AND CARCINOMA

In a recent editorial¹ on "The Ulcer Carcinoma Problem of the Stomach" Bigard stated that "Gastroscopy is of no help because it provides merely the observer's visual impression which at best lacks the precision necessary in dealing with carcinoma. It seems to me that this statement is not quite fair to the gastroscopist because although he may make some mistakes he is sometimes able to give quite positive evidence that an ulcerating lesion of the stomach is malignant. When for example he sees a rather large ulcer with raised nodular margins and a dirty base over which peristaltic waves do not pass he can be fairly certain that he is dealing with a malignant ulcer. On the other hand when he sees a comparatively small ulcer with sharp margin and a clean base with no surrounding induration and no interference with the per-

istaltic wave he will usually be correct in believing that the ulcer is benign.

Unfortunately in the case of most other diagnostic procedures it must be admitted that such evidence cannot be considered 100 per cent correct but the gastroscopic picture is of value when added to the x-ray examination and the clinical data. In my opinion a more accurate diagnosis can be obtained in the gastric ulcer carcinoma problem when all methods of examination are used in a given case than when reliance is placed on incomplete data. Gastroscopic examination supplements x-ray examination; it does not in any sense compete with it. Reliance can be placed upon gastroscopic examination only when the method is carried out by an experienced gastroscopist who knows the limitations of the method, the relative blind areas in the stomach and the proper interpretation of his observations. If gastroscopy, x-ray examination and the clinical data all point to a benign lesion we believe it is safe to keep the patient in bed in the hospital for a period of three weeks on a careful medical regimen, then re-examine by x-ray and by gastroscopy and re-evaluate the situation. If there is any question of carcinoma the patient should be explored surgically. A fairly safe rule in dealing with gastric ulcer is to consider it malignant until proved otherwise, but I do not believe that it is fair to say that gastroscopy is of no help whatsoever in the ulcer carcinoma problem.

In a recent lecture Benedict studied 4 proved cases of gastric pathology in an at-

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tempt to correlate the gastroscopic x ray and pathological findings. An analysis was made of 15 cases of proved carcinoma of the stomach in which it was shown that x ray and gastroscopic examination were equally good in 67 cases equally doubtful in 3 cases the radiologist more accurate or more helpful in 32 cases and the gastroscopist more accurate or more helpful in 20 cases. When the lesion was equally accessible to both methods of examination the analysis seemed to indicate the relative superiority of gastroscopy over radiology in differentiating benign from malignant gastric ulcers. In the same report 50 cases of proved benign gastric ulcer were also analyzed

and in 16 of the x ray and gastroscopy were equally correct in 9 cases equally doubtful in 11 cases x ray was superior to gastroscopy and in only 4 cases gastroscopy was superior to x ray. In both the carcinoma and the ulcer cases gastroscopic failures were due largely to mechanical difficulties which accounted for 23 of the 32 cases of x ray superiority in the carcinoma group and for 17 of the 21 cases of x ray superiority in the ulcer group. In conclusion I believe that gastroscopy is of value in the ulcer carcinoma problem and that the most accurate diagnostic results are obtained when all methods of study are used cooperatively. EDWARD B. BENEDICT

November, 1945

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- H E A T L E Y N G T h A d t t f P n G o s M I D u r r D I d l y A C
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- D u G l a n d s W r z A S d S ~ E B H d t y f t h R h
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- G m l s A C l S t d y f I t l t f g y C e s f D p t d P t g 442
- C o u r s d T m t P u n s H r A B E L O W R d N c t S
P A T T J P d S C H A E F R L S P t y E l e c t O c l d E f t h P t a l 443
- V d m d A d l C t l T u V 443
- S u r g e l P t h o l g y n d D a g o s i s H p t a l s M e d i c a l E d u c a t i o n d H i s t o r y
P R E N T E D u v y N P p l l y C y s t a d l y m p h m W l l s D B T h C c u D t r d t h H t f d
f t h S a h y G l d s 44 H o s p t l 443

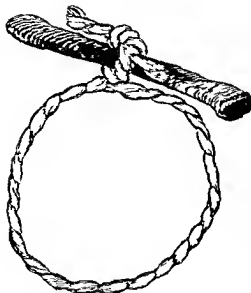


Fig. The garrochero (64) Spanish windlass first used in the Battle of Bessançon.

pressure with a sterile dressing over the bleeding area or pressure along the course of the spurting artery may secure hemostasis.

As was noted before there are many types of temporary tourniquets. A form which permits adjustment of the constriction just beyond the cessation of the blood flow is desirable. The proper tension is very difficult to obtain with the Es-



Fig. The tightened belt used by the British Army in the Crimean War.

March bandage or the tubin tourniquet applied in successive turns either excessive or inadequate pressures being the rule. Ball and Quist (12) commenting on air raid casualties in London state that although most of the patients with injuries of the limbs had tourniquets applied before admission to the casualty station in most cases they had been applied ineffectively and had allowed a slow steady ooze of blood. These authors believed that a firm sterile dressing applied directly over the wound would be of more value for routine use. A trial at adjusting the rubber tourniquet at reasonable level above the systolic blood pressure will show that variations of 150 mm. or more are frequent. Authors agree that the placing of an arterial tourniquet at the effective tension is a matter of practice. Also it must be re-



Fig. The screw type tourniquet, 78

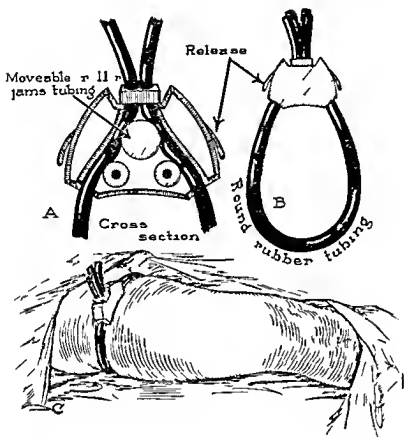


Fig. 4. Rubber tubing tourniquet. Shows in cross section how release is jammed in place by the blades of the tourniquet.

membered that each superimposed turn of the Es-march tourniquet has an additive effect. This is easily shown by placing a blood pressure cuff about the arm adjusting the tens on to 90 mm Hg and then applying turn after turn of the Es-march bandage over it. The first and each successive turn raises the constrictive pressure by 30 mm or more according to the pull maintained on the free end.

The temporary tourniquet in contrast to the permanent one should be placed as far from the wound as is convenient (with avoidance of certain vulnerable areas) because it is often more difficult to apply and because its periodic release will disturb the wound. If possible the extremity should be elevated before each application to retain the blood contained distal to the tourniquet. Although no experimental evidence is available to determine the frequency with which the tourniquet should be released it is generally supposed to be at half hour intervals. The tourniquet

should be moved slightly each time to minimize the local damage. This interval also allows opportunity to note whether hemostasis has occurred which will make the tourniquet no longer necessary. Periodic release also diminishes the severity of the shock which as we shall point out follows release after prolonged constriction. The lowering of resistance of the tissues of the injured limb is also counteracted to a certain degree by this periodic flushing and reoxygenation of the extremity.

All persons with tourniquets in place must be regarded as surgical emergencies and be given hemostatic operative treatment at the earliest opportunity. Good field technique includes the administration of morphine for the pain from the arterial tourniquet and the use of care to prevent movement of the limb or slipping of the tourniquet which would result either in further hemorrhage or in damage to the local tissues.

A last point concerns the desirability of refrigerating the extremity distal to the tourniquet

TABLE III — TOURNIQUET INJURY OF THE NERVES

(F m Eckh ff 93)

Age sex	Operation	Paralysis	Recovery	Aneresthesia	Recovery
15	Fl Dig I	Cl Med.	m	N	
F	Flex Dig I	Cl Med.	3 m	mb h d	3 mo
F	Fl Carpal.	Rad.	3 m	ne	
M 7	E Rad I H ad	Cl Med. Rad.	5 m	T gl n r head	d r
F	W n r, Hum rns	Rad.	6 m	Doubtful	
M	Pla Radius	Rad.	m	Numb h d	3 da
15	Ex Fragu Hum rns	Cl Rad. fed.	m	T tall re rm	wk.
M 7	Ex Crst. W	Cl Med. Rad.	m	T tall re rm	3 da
F	Transplant, Cl	Cl n M d. Rad.	m	Total re rm	da
15	S Brach rad T d.	Cl Med. Rad.	1 m	ne	
M 6	S Fl Dig I	Cl Rad. fed.	1 m	T all re rm	1
M	Pl ng Radius	Rad.	3 m	T all re rm	m
1	F ng Radius	Rad.	m	Hand	da
M	Op Reduc Elbow	Cl Med. Rad.	mo.	T all re rm	m

TABLE IV — NERVOUS TISSUE SURVIVAL WITH ISCHEMIA

Small cortical pyramidal cells	8 m n.	Corne ad Pl ()
Brain: hum. <i>Macaca</i> sp.	5 m.	11 yr ()
Medulla	m	Go 1 P ()
p. gangl.	3 m	Com ad Pl (3a)
gangl co d	hou	El 1 h d Bree ()
Sympathetic gangl.	hou	T a ()
Myo en plexus	3 hours	Canno ad B k (20)

Following this period of elevation the cuff should be inflated rapidly to the proper pressure. Hesitation results in venous stasis and engorgement of the distal blood vessels. Inflation is often the duty of the anesthetist who is not aware of the necessity for decisive action. He need only allow the pressure to stay for a moment below systolic blood pressure to distend the blood vessels. The use of the long flat Esmarch bandage in spiral fashion to express the blood from the extremity before application of the tourniquet is helpful but usually elevation alone is enough.

The fifth and last factor which limits the duration of the use of the tourniquet is the effect upon release of the tourniquet. The restoration of the circulation is accompanied by a fall in the blood pressure (19) the degree of fall depending on the duration of the constriction, the condition of the patient and the amount of tissue rendered ischemic. Chart I from Wilson and Roome (56) shows the customary effect. In this case release of a tourniquet from the thigh of a patient after two and one quarter hours of constriction resulted in a sudden drop of 35 mm Hg in blood pressure. This drop must be avoided if the patient is in a precarious condition. The pressure rises again then slowly fall to slightly below normal. Table V also from Wilson and Roome (56) shows in detail the relation between the duration of the constriction and the incidence of death after release. With less than three hours of constriction none died whereas with more than six and one half hours of constriction all died. Table VI shows the effect of various forms of treatment on the shock produced upon release of the tourniquet. Without amputation all dogs die. If the treatment consists of amputation and blood transfusion the animal recovers. Blood alone does not save them. Blalock (133) has shown that in an area of 24 per cent of the total body weight removed as plasma at four hour interval results in the death of the dog in a cage of twenty-eight and one half hours. Milon et al (43) obtained similar results on release of tourniquets from the hind legs

The interval between deflations will vary with each case but a half hour interval is safe. This is also true in plastic surgery in which the viability of skin flaps is questionable. The safe period is said to be prolonged by packing the bases beneath the limb and irrigation with cold saline solution.

The length of time the cuff must remain deflated to allow reoxygenation of the tissues has not been determined nor do estimates appear in the literature. Three minutes is a reasonable time. Shorter periods would not allow adequate exchange between the intercellular fluid and the blood. A longer wait would prolong the operation unnecessarily.

Elevation of the extremity before inflation of the cuff is customary. As a result the venous ooze during the operation is decreased and a certain amount of useful blood is restored to the circulation. Prolonged elevation brings about a physiological compensation with vasodilation which cancels some of the gain. Too brief a period of elevation does not allow maximum fall of the venous pressure. Three minutes is generally accepted as a reasonable period.

TABLE V — EFFECT OF DURATION OF CONSTRUCTION

(t		W l s	d Room	936)
Number	f d g s	Du	l n s	R l
		<5 h rs		d d
		5 to 6 h rs		d d
5		>6 h rs		All d d

of do s The rather direct relationship between the amount of fluid lost into the constricted or traumatized leg and the development of shock suggests that the phenomena following release of a tourniquet after a long period of constriction are due in the main to loss of fluid from the general circulation into the extremity because of the increase in permeability of the capillaries due to the ischemia (53). The application to operative surgery is obvious: the period of ischemia must be limited and the ischemic area must be kept as small as possible. When the cuff is removed the patient should be watched carefully for a precipitous fall in blood pressure and be observed for a later gradual decline in this pressure. Patients who are in or near shock should have tourniquets applied for short times only, with frequent deflation of the cuff. As Davis (22) stated: "We have had an occasional drop in blood pressure upon release of the constriction and are familiar with other instances in which the patient developed profound shock immediately after this procedure."

The danger of shock and of damage to the tissues rather than injury to the nerve and skin or gangrene is the limiting factor to extended applications of the tourniquet. Four hours is a safe period to maintain constriction in the operating room and should cause no damage.

Effect upon the local tissues by the cuff. Local compression of the tissues is effected by two factors: the width of the cuff and the pressure of the cuff. The desirable width of the tourniquet has not been established. Allen (7) advocates a narrow tourniquet but does not take local damage to the skin sufficiently into account. A wide tourniquet on the other hand distributes the compression over the unequally yielding tissues and does not cut into the skin. Iagan and Bordley (47) have shown that a narrow sphygmomanometric cuff gives blood pressure readings which are too high. If it flows then that it takes a higher pressure with a narrow cuff to stop arterial blood flow than with a wide cuff and so the narrow cuff leads to greater damage of the tissues. This is supported by the work of von Recklinghausen (48) and of Norris and his co-workers (44).

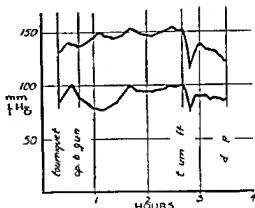


Chart I. Effect of tourniquet on blood pressure (F. M. Wilson, d. Room 1936)

The factors governing the pressure to which a pneumatic tourniquet should be inflated are often misunderstood yet are obvious in principle. An arterial tourniquet is used to stop arterial blood flow. The level of from 240 to 260 mm Hg most often used was chosen to be above the systolic blood pressure of all but the most severe hypertensive patients. Blood may escape under a cuff set at 240 mm, but such pressure is not needed in most cases. Lahz (38) who alone discusses this question believes that from 10 to 20 mm above the preoperative systolic blood pressure is enough. A different conclusion is reached from a study of the blood pressure records of 137 consecutive operations at the Cincinnati General Hospital 100 of which were performed with general and 37 with local anesthesia (Chart II). The preoperative systolic blood pressure is charted against the rise during operation above the preoperative level.

TABLE VI — SURVIVAL AFTER RELEASE (F. M. Wilson, d. Room 1936)

Duration of Constriction (hours)	Tissue	Survival (hours)	Wound (type)
Blood and saline solution	muscle	6	7.3
Blood and saline solution	nerve	7	
Plasma		3	6
Plasma and saline solution			6.5
Amputation 4 hours release blood		Recovered	
Amputation 4 hours release no blood		Recovered	
Amputation 1 hour release no blood		8	
Amputation 4 hours release no blood			

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d rs C 9 9
- 34 GOMEZ L d Pr E FH J Exp M 900 1 57
3 HELL DO RS Qu t d by Leo d (39) p 5
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cula Inj ries Pp 99-20 Philad lphi WB
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- 37 J H SOV GS d BLALOCK A. A ch s rg 93
6 6
- 38 LAKE RS Med J A tral 94 465
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- 5 RO B D N Zeal d M J 933 3 5
- 5 SHARPE SH ER E Brain 9 7 5 538
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- 53 SWINGLE W W R M TO J W KLET S W
DRILL, V A d E R SOLE W J Am J Phys i
94 33 6
- 54 THOMPSON CJS Th H t ry d E l t f S
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- 5 T CKETT I J Phys i Lo d 90 33 77
- 56 W LSO H nd ROOMER N W A h Surg 1936
32 334

ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

Woodhall B and Spurling R G Tantalum
Cranioplasty for Wound of the Skull
J S 2 1945 649

As res it f the l ge number of cran i injuries
a t a n e l in the p e s n t w r interest in treati g the
o f t n e n o m t a n t c r n a l d e f e c t s h a s b e e n r n e w e d
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t i c s t a l l u m n d t a n t a l u m O f t h e s e t a n t i m
h a s b e c o m e the m o s t p u l a r b e c a u s e o f i t s i n e t
n e s s a n d t h e a s w t h w h i c h i t m a y b e h a n d l e d A l
t h o u g h m e t h y l m t h a c r y l a t e a n d v i t a l m m a y b e
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i t m u s t b e c a s t

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i m p e s o n w u l l b e a l a b l e t h c o d p e r t n
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f o c J c k I W o o l M D

Pugh D G Fibrous Dysplasia of the Skull A
P b a b l e E p l a n a t i n f l e o n t i s i s O s s e a
R a d i g y 945 44 548

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n v l m e n t o f t h e r e m a i n d o f t h s k l l t f f
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h u l d b e c a d u t I n m o t c a s e s i t s e e m s p o b



F i g 1 P l y o s t o t i c f i b r o u s d y s p l a s i a T h p a t t h a d
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controlled treatment with thiouracil cleared up the condition

Fibrillation and cardiac decompression in the thyroacoidosis were noted in patients. Complication with normal sinus rhythm was restored after six weeks and eight weeks respectively with thiouracil therapy.

The case was a unique instance of resistance to thiouracil.

The data presented in this report demonstrate clearly in favor of thiouracil as the drug of choice in inducing a permanent state of remission in patients with thyrotoxicosis.

M. THIAS, J. SEIFE, T. M. D.

Erich J. B. Th. Treiman, Ext. n. Cicatricial Stenosis of the Larynx and Trachea. *J. Path. Ch. C.* 94: 41-343.

Extensive cicatricial stenosis of the larynx and the upper part of the trachea usually can be treated most successfully by an open operation through an incision in the neck. Vascular exposure permits accurate excision of the thickened cartilage producing the stenosis.

In those cases in which this precise method of reestablishing the normal dimensions of the larynx or the tracheal lumen is to be employed, the distinctly advantageous to the method of treatment into three separate stages: (1) the surgical removal of the cicatrix; (2) the mechanical protection of the stenosis toward narrowing or constriction of the normally delimited area (a long period usually six months); and (3) the plastic closure of the external tracheal opening.

The difficulties which arise in the case of patients during these three stages of treatment which are discussed in length are due to the nature of the techniques which are capable of producing desirable results but to the use of simplified methods of treatment with fewer moving technical details and fewer operative phases.

The author has developed a plan of therapy which in his experience is comparatively unmodified which is greivable to the patient because of the causes of discomfort nor requires any form of laryngeal examination or manipulation during the procedure.

control of the time and which has produced gratifying results in high percentage of cases.

N. ANDERSON, M. D.

Harrison M. S. D. See of the Cervical Spine. *Laryngological Practice J. L. Otol. L. O.* 94: 59-301.

Three cases of disease of the cervical spine are described. In an osteoarthritis of the cervical spine with marked hyperostosis of the vertebrae produced a peculiar feeling with the thoracic spine and stiffness of the neck. The lipping is demonstrated on roentgen ray.

In the case of osteomyelitis of the fourth and fifth cervical vertebrae developed with a sudden onset. The symptoms first appeared during the night. The patient felt a pain in the neck and a feeling of stiffness. The lesion of the vertebrae was demonstrated by roentgenogram. Epidural infection is indicated by sensory and motor changes in the upper and lower limbs. Treatment is carried out by excision with plaster of Paris collar and drainage of the penicillin. The results are very favorable for the patient. A definite benefit is obtained in the case of the patient with a good result.

The third case was that of a nine-year-old child with a nasopharyngeal tumor. The patient had a chronic throat infection and a difficulty in the swallowing of food. The tumor was located in the upper part of the pharynx and the head of the tumor was protruding. The patient was treated with a plaster of Paris collar and the tumor was removed. The results were very satisfactory and the patient was able to swallow food.

The cervical vertebrae are less equal in size to the osteomyelitis than the lumbar and sacral vertebrae. The majority of cases are hematogenous in origin. A small number are due to direct infection from an infectious process in the pharynx. The taphylococcus is the common organism. Retropharyngeal abscess is a common condition. It is less common in the present time. The patient is usually a child or a young man. The cervical vertebrae are the most common site of infection. The results are usually good.

J. ANDERSON, M. D.

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS CRANIAL NERVES

Kozl H L P traumat e Pers n lity and Psy
chiat le Seq ela f Head I jury Categ lea
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was in the alveolar walls. Opponents of the theory hold that these neoplasms arise from a single focus probably in a small bronchus and then metastasize rapidly to other parts of the lungs by way of down growth in the bronchial tree and by extension through the pores of Kohn into the lymphatics and the blood vessels.

I split of the argument that the authors believe these reported cases differ from other forms of pulmonary tumors that they should be given special consideration.

The majority of alveolar-cell tumors are malignant but some are of the histologically benign Sins Hatt and Nicholson reported cases probably of this character calling them bilateral multiple pulmonary metastasizing epithelioid epithelioma of the alveoli and pleura mucous epithelial hyperplasia. The third case reported here was somewhat smaller with a lower grade of histological malignancy marked mucinous secretion and absence of regional and distant metastases.

The clinical features of this tumor are similar to those of the other malignant mesenchymal tumors of the pleura. The most common histological features are the presence of large, pleomorphic, hyperchromatic nuclei, and the presence of numerous mitoses. The tumor is composed of large, pleomorphic, hyperchromatic nuclei, and the presence of numerous mitoses. The tumor is composed of large, pleomorphic, hyperchromatic nuclei, and the presence of numerous mitoses.

Mucosal cells of the colon consist of an plastic columnar or cuboidal epithelial cells that have a large cell protruded at apical wall and a deep groove. The cells often form papillary projection. Mitoses are present. Occasional nuclei reveal nests of tumor cells in the submucosa. Thrombosis inflammation and easily abscess formation are often seen. Giant cell fragment of nuclei and desquamated tumor cells in the alveolar spaces are seen. The lymphatic spaces contain tumor cells. Periductal infiltration and mucin secretion are common. Mixed fibrosis of the interstitium is usually seen. The bacteria in the colonic mucosa may contain macrophages and leukocytes.

Fom the r t en log cal poi t f ew the pro-
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d difficulty fco d s e diagnosis nd nt Th cent
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clinical features such as lack of weight progress, weakness, chronic respiratory failure, the scales in the tumor diagnosis but as for alveolar cell tumor of the lungs is concerned the diagnosis in the majority of cases is beyond the realm of the ray differentials and can be made

only by microscopic examination. If we accept the results with multiple nodular calcifications that shadows without evidence of primary tumor, where this mass should be suspected.

Ro r R B r w M.D

Jackson C. L. K nzelmann F. W. d \ rrls.
C. M. Bronchl 1 Aden m J Thorac S f

The authors are clearly aware of the records of 120 cases typical of the clinical and pathological entity known as bronchadenoma of the bronchus and they present the essential features of these cases in a table in this article. The symptoms are usually hemoptysis and cough often productive. The general gramework is negative; all wheezes but generally wheezed obstructive atelctasis and occasionally effusion. The ages of the patients varied from thirteen to forty-four years and 80 per cent of the patients were women. Bronchoscopy has been done in all of the cases but the tissue was by means of an endoscope the first time the slides were examined. If it is a squamous cell carcinoma the various diagnoses made by different pathologists and on different occasions by the same pathologist for many of these cases. The authors believe that they have made some progress in the diagnosis and stand ready to criticize if recognized and present their record with this in mind.

Name us co tr but ns to the re ent it ratur
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The cells are cuboidal, sometimes enclosing spaces. They may form two or more layers to fill the space fully. Within the first layer are flattened polyhedral cells and they may be present freely or in irregular lines. The cells are so close together that contact planes are unobtainable.

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4. Occasional rapidly growing tumors
the glandular pattern is not so

5 Sometimes parallel membranes are either
as records of cell growth or depth of immersion

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n look l ke th pseud os ttes e n n t m rs of
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The statement is false and poor evidence where
regret has occurred but frequently it is rich

capillaries and shows interstitial hemorrhages and proliferating fibroblasts are found to invade the clot and surround the tumor masses. It may be that these fibroscars which promote regression in the denser areas often contain hemosiderin deposits. Where hemorrhage has not occurred the capillaries wind in and out around the acellular structures which gives a picture closely resembling fetal lung. Rationally the active proliferating capillary endothelium which may sometimes will confuse and lead to an erroneous diagnosis. The authors have encountered both a cartilage in the tumor but neither have they found proliferating mesothelial cells. It is believed that these tissues are incidental and not a true part of the tumor.

The authors believe that these adenomas may infiltrate the bronchial wall or any tissue in their path. The infiltration is sufficiently frequent and limited when it occurs that endobronchial removal is justifiable. Complete removal often is impossible and if complete the tumor recurs. However, repeated removal does not seem to cause a rapid growth or alter the behavior of the remaining cells. There is no evidence of metastases caused by the blood or lymph stream. It is possible these tumors may become malignant but the authors have not observed any change occur. Diagnostic accuracy depends on the pathologist's seeing the whole picture and the extent of the tumor. Small numbers of giant cells if large should be destroyed by serial section.

Since the clinical picture may only suggest the final diagnosis in the cases must be made by bronchoscopy with biopsy. Needle biopsy is of adequate and lobectomy and pneumectomy may still be done. It is well known that 75 per cent of lung carcinomas can be subjected to a bronchoscopy. These figures do not apply to all of the cases they characterized. Locally occurring bronchial adenomas are easily removed by bronchoscopy.

One of the diagnoses has been made serially during bronchoscopy should be done to relieve the bronchial obstruction. This is accomplished by pneumatic resection of the tumor. Electrocoagulation or cautery of the tumor is both effective and produces less bleeding and is safe and more efficient in most cases. The authors stress the importance of the patient's terminal cough removal of the lesion.

When the tumor can be removed by bronchoscopy, the drainage of the trachea and the bronchus is free. The radical treatment may be postponed. All patients should be kept under observation and the endotracheal tube removed. The complete removal of the tumor by bronchoscopy is difficult. In many cases the tumor is completely removed. In many cases the tumor will remain. The treatment of the tumor is therefore only as successful as the bronchoscopy.

The authors believe that lung resection is indicated in cases of bronchial adenoma in which because of sessile attachment and size bronchoscopy removal is not feasible and (2) in cases in which cavitation bronchiectasis or other severe damage to the distal portion of the lung has resulted from prolonged bronchial obstruction.

A very difficult situation obtains in the case of bronchial adenoma in the case of carcinoma as far as surgery is concerned provided drainage and attention can be reestablished. The adenoma is slow growing and does not metastasize and does not have any inherent tendency to become malignant. A contrary opinion has been due to error in histopathological diagnosis. *Ross and R. Bigelow, M.D.*

Graham E. A. and W. Mack N. A. The Problem of the So Called Bronchial Adenoma. *J. Thor. Surg.* 1945, 4, 106.

The so called bronchial adenoma is now known to be a common tumor with well recognized characteristics. It nearly always occurs in a primary bronchus and is enough to one to be visualized by the bronchoscope. At the lecture of a lobe or lung is common and frequently the bronchial obstruction causes an associated bronchiectasis. Women are affected slightly more often than men. A contrast to the preponderance of malignancy of carcinoma usually the symptoms appear earlier than in ordinary carcinoma. In childhood a diagnosis of carcinoma is typical showing a smooth rounded polypoid mass protruding into the lumen of the bronchus. Often only a small portion of the tumor is endobronchial most of it being outside of the bronchus. Ulceration is rare even though the tumor is a common symptom. There seems to be a strong association of bronchial adenoma with other congenital lung abnormalities such as absent interlobar fissures or excess vascularity congenital cystic disease or abnormal bronchi.

The histological microscopic pattern of the tumor is of the bronchial epithelium which often shows squamous metaplasia. Directly beneath the tumor is a fibrous tissue layer of varying thickness. The tumor is a tumor mass composed of cells with scanty cytoplasm and small round nuclei with clear nuclei and mitoses arranged in a solidly cellular pulmonary alveoli. These alveoli are separated by a stroma of blood vessels and loose edematous fibrous tissue. The cells resemble normal like and the cells are similar to hyperplasia. When the stroma excessively vascular the tumor appears glomerular. The tumor is benign and is a bronchial adenoma. In some tumors the tumor has been demonstrated by mesothelial cells with the rest of the tumor as fibrous smooth muscle of the fibrous and hyaline cartilage. In venous have been seen in the tumor section of the tumor. The tumor is a bronchial adenoma.

The histological features of these tumors suggest that they may be derived from the

gan edembryon ch ds whi hha ef sledt de l p normally or hav atr ph ed Theft tthat these ad nomas have m ny ch racterist es lke the mixed tumors of the sal arv gland led t the authors calling them mixed tumors of the l n r 1 938 These charact ristics a e the p esenc of cart l ge or bo e the t ndency to in oke n hborn tis ues di ectly and th occas l t m format by the connect ve tssue elements Path logists m bt quest on this last charact ristic but th authors be l e v th t many cases f scho dr m fibroma l poma myxoma a dev n sarcoma of th l ng o i n te in the so-called a lenoma or mixed tumo of the bro chus but in wh ch mesodermal leme ts pr lferate w th th corresponding epithel lprol lrat n

In acc danc with the uth rs id a two ma n groups of pulmonary tumors can be th ight of o ccurring because of sal ut f a br chial hui to d elop into a norm l ad l arra gement of t s u These groups are (x) thos i wh ch mesod rmal elements p edominate such s pulmo ary chondrom steoma fibroma l pom ng ma myxoma a d sarcoma and () those in whi h ntod rmal (or epithelial) elem nts a e dominant illust ated chiefly by th bron hial adenoma This w uld expl n th ex trem freq e cy with wh ch p th hial el em nt ar found in the so-called rhond oma f th lung a d mesodermal elements r found n the epith lal tumors

Th chief lin cal problem concerning these tumors is wh th r they a a tu ally o potentially inva v If on accepts in as n of the dj cent tissues r go a l lymph nod in olvement and dist nt metas tases as criter a f malignancy n th l bt lcon d erable experie ce o cann t d ny that there have been cases i wh ch thes tumors b cam mal n t

In 938 the auth rs pini was that these ad nomas wer pote tially m l n t and they e p rted cases n which in as n l th adjac nt t sues or in ol em t f th regional lymph nodes occurred Kirch o Pe n W lkw tz And rson Stowell and Ad ms St inner and Block llhav e reported cases of m l gna t cha ges in so-call d lun ade omas

The auth rs p ese t a case wh h an d noma had pursued a b n gn cours lor mo than tw nty years before th cam m l gna t At on tim it ap peared that the m had been complet ly moved thr gh the br ch cope but an t n carcino ma with l er m tastas e tu ally d el ped

An ther ca e s p es ted n wh h bsd gn s f a mi ed bronchial t mor m d p chiefly of epithe lial elements w s mad by bro hoscropy A t tal p eum nectomy was d ne w th d ficulty becaus th halar gland e nvolved The diagnosis was confirmed by m cro p e ct a s d t utops/ two days lat r wh n metastat e ca in m of the tracheobronchial lymph nodes a d l er was f und Th auth rs bel th case s n xampl of an de n ma f the bro h s hich ha become mal na t with metastases t th reo al lymph glands a d live They co jectur that if th had been s nearly

b fo e m tastases de el ped t uld ha e been called a benign aden ma f th bron hus

The f al ca e presented is of an ob struct ng p l lary t m r f the right uppe lobe bro chu f rion bronch scopy Th pati nt underw nt a right total pne m nectomy and re s r d Of great nt rest was th path l gical pe men s egro x m a tion re led n e idene f tum r in the dja e t lymph nod s The m cro cop e ct s sh wed an e trem ly bizarre mal gn ntum r of th lung n wh b both p th l l nd co n cti e t eel ements wer tak ng part A hn l d gn os of m ed b o chogenic ca c n ma and sarcoma s m de Th a thors h l e s this to b an ustanding xampl of a m l gna nt trans sm t of tumo wh ch l se n e r l er would ha e been called a br n h al ade oma Mo e m te est g s th f ct that both epith lal and c n cti e tiss e elem nt h v bec me mal gn t whi h s support for the authors theory that e the ntod rmal or mesod rmal l ement of a l t n bron hial b d may take on th f t res of a pro pl sm and th t e the type of elem nt mav becom m l nant The presence of bone in th s mix d car cinoma and sarc m supports l rth the u e of th t m m r d tum r of th bro h s

Th s tumors hen first a e are usly fow l t b benign and s me of the ind viduals ha bor n them m y f lll the r normal l e spa the tumors n t b e m n mal n t Altho gh there is evide ce that a patie t ha b d symptoms from such a tumor for twe ty years it s are to find a bronchial ade m at aut psy after m d l age The rason for th s probably l e s th f ct that th m j ruy of these tumors becomes m l gna nt and often los th e r m al d nty I this aspect a ad noma of th bron hu uld b m rely foll w ng th rul of what is ll established n re ard to ad nomas of th b ast pr atate thy o d a drect m

In rev f th w l l e tabl bel m l na t pot tial tes rad cal surg cal emoval s e les ly th p o cedure of ho ce Broncho op e rem l raly could be c mplete becau e l th fr qu cy with which la g pa t f the t m l o t side of th bronch s Th r l th d d t l h ard f bro ch al perforat n with b b cop e emo l If the t mo is n t c mply r m ed the r m n t s may late becom i vas v An the b j e t local rem val is the c rta nty n m ny ca s t wh ther the tum r is actually mal gn nt f th t m of op rat n Tissue m ed by br n hial b ps may n t be lea ly mal n n t e n wh the tum r has al ealy nvaded ghbor ng t s s g n l lymph nodes B boscop rem l m y be satisf ctory al o b cau e of th oc ated br n h ectasis suppos dly d e t br nch al b tract l th tum r Lobert m y will om t mes be ad q t but beca f th l cat n f th t m t tal pa m eed m y w l l m r ft be necessary This f ed e y wh h l ed e nal lymph odes can be rem ed m e ealy nd wh ch good risk p e r s is ly l hly m ed x th lobectomy R ext R. B low M D

Spontaneous pneumothorax may appear asymptotically as found in 5 per cent of the authors' series. Its discovery on routine chest roentgenograms may be assumed that the accident is more frequent than clinically proposed.

Recurrents take place in about 20 per cent of the cases and in the moderate recurrence was uncommon in men over thirty years of age.

Spontaneous pneumothorax occurred more often in the authors' series during relatively slight physical exertion with the patient at rest than following undue physical stress or strains.

Röntgenograms of the lungs taken from most of the roentgen-exposed patients collapsed lung were negative in all but 4 instances. In the great majority of cases one cannot tell from the film that a pneumothorax ever existed nor could it be predicted from the film whether the patient would ultimately recur. On the contrary, numerous cases of bullous emphysema seen at the institution on gave a history of spontaneous pneumothorax.

JOSEPH K. NAEF, M.D.

Blair, B. Hamilton, J. E. and Dugan, D. J.
Observations on the Treatment of Empyema
Thoracis with Penicillin. *Surgery* 94:5 572

When the possibilities of alluring the management of empyema by the use of penicillin are considered the question of adequate drainage and irrigation is the most important. The prevailing tendency in the treatment of empyema with penicillin has been to delay drainage and thereby decrease the chance of permanent operation in the case of an abscess in the form of a stage. Moreover, the use of penicillin will control quickly the pneumonic stage of the disease and consequently decrease the risk of an type of surgical intervention.

The evidence is indisputable that penicillin is a valuable adjunct in the treatment of empyema thoracis caused by the penicillin-vulnerable organisms. Systemic administration of the drug alone will sometimes cause cultures of the fluid in the chest to become sterile. Intrapleural injections of penicillin will temporarily sterilize an empyema cavity in the great majority of cases. If a combined systemic and intrapleural administration is desirable because the combination affects both the pulmonary and pleural lesions.

Probably penicillin will be extremely effective in hastening empyema maturation but nevertheless it is recommended to continue to form the fistula through the cavity closure cannot be ignored. If the lung is not rapidly with the disappearance of pus when conservative measures are employed the authors believe that surgical drainage is mandatory. Further observations of the fundamental principle of drainage of pyogenic empyema is that the pus is derived temporally in the pleural cavity. While the pneumonic complication is characteristic. This occurred in 1 of 4 cases observed.

It should again be emphasized that the introduction of penicillin has not altered in any way the

fundamental principles of treatment of empyema thoracis and the authors are convinced.

Dr. JAMES COLLIER, M.D.

Blades, B. Penicillin as an Adjuvant to the Surgical Treatment of Acute and Chronic Empyema.
A. S. J. 1945 67

ACUTE POST-ELMOIC EMPYEMA

Observations indicate that when suppuration is caused by penicillin-vulnerable organisms intrapleural injections of penicillin will improve the results. The pus is thick and contains a high concentration of bacteria. It is usually necessary to resort to surgical drainage to evacuate the material. If this is not a chronic empyema may develop a fibrinous pleuritis. The pus then becomes more problematical to liberate and remains to be of aid.

As penicillin with penicillin therapy accumulates the therapeutic apparatus will become more resistant. Based upon the authors' observations a tentative plan for the use of penicillin as an adjunct to the surgical treatment of acute empyema is suggested.

1. An injection of 50,000 units of penicillin may be given intrapleurally as soon as a infected fluid appears in the pleural cavity. It is important that treatment be withheld until the organism is positively identified. This precaution will prevent the use of penicillin in infections which do not respond to the drug. A definite initial bacteriological diagnosis will also rule out the possibility of a tuberculous infection.

2. If systemic penicillin has been employed during the pneumonic stage of the disease the author believes it should be combined with local therapy. It is admitted that many instances the penicillin phase will have subsided by the time a pyogenic becomes apparent. The advantage of this system is that it allows the blood to be cleared of bacteria. It is not possible to say that the blood may be cleared of spreading cell cultures in association with the author's patients. The reference to this is made in the treatment of penicillin. It would also be combined with local therapy. This is true particularly in cases of streptococcal and staphylococcal empyema. Probably three intrapleural injections of 50,000 units of penicillin are sufficient for local treatment. Before the penicillin is injected into the pleural cavity the infected fluid is possible to be removed by thoracentesis. If the pus contains a high concentration of bacteria surgical drainage should be established. Temporary and permanent sterilization of pus does not alter the most important fundamental surgical principle, that is, empyema thoracis namely, drainage.

CHRONIC EMPYEMA

After adequate drainage has been made the case has been established. It appears that the local non-toxic drainage treatment of penicillin is important. During the period of observation to de-

te min bethe the cavity w ll becom oblite at d
thout furth r u g cal intervent n there is littl
danger of sp ead ng cellulitis or inv sive infection
C nt nued f ver d failure to g n weight and other
manifestations of seps s usually mean an und a ned
o nadequately d ained collection of pus No chemo
therapeut c agent can be depended pon t r place
p per dr image in the tre tment of pyrogenic
abscesses

Probably the most valuable role of penicillin in the
treatment of chronic empyem is the protection t
may afford against spreadi g infection when a rad
cal operation is u de taken f obliteration of the
cavity Wh n penicillin is u ed as a prophylact c
t for this pu pos it is impossible to make a p e
case evalu t n f its b nefits It seems r so ahl
howe r that when o c is wo king thro gh an m
fcted or pot nt ally infected fi ld pen cilin protec
tion may ften p e nt serious w und inf cti s and
th r complications

THE PREVENTION OF POSTOPERATIVE EMPYEMA IN CASES OF LUNG RESECTION

Since post perat e mpyem i th princ pal ca s
f both mo tality and mo b d ty after the esect n
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an effort to reduce the incidence f this rio s com
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tence i 6 cases so t eat d that it had an app
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R ecently t a thors b e had an opport nity t
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It is th auth mpress that i th s ri of
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Jo J M L Y M D

HEART AND PERICARDIUM

U er G J a d St w rt H J Th S rgical
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N York Stat J M 945 45 993

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and the fore it is often called by h s name

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ha e had unusual su g cal instincts and whos nam
s wid ly kno n n c onnection with the operat n f
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only sugg ted hut ins ted bet e n the ye rs 1895
and 1898 that surgery be att mpted in this di c
ll s ad ic howe r was not immediately fll w d

Th ca e of the thick ned co tract d adhe e t
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mony s psis o a previo s pe icard tis with eff
sio as m 5 of the thors cases Yet in most of the
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r l as d an creta e n th v nous pressu e
was present i all of th cases

The le d gel s to a corr ct d gnosis are the
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and the elect ocardiographic findings of low oltag e
QR S complexes and T va es

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The 11 rats received 256 patients subjected to operation with a primary mortality of 9 per cent. Of the fatalities 25 occurred upon the operating table and 49 occurred during the immediate postoperative period. To have lost the first fourth of the number of patients subjected to operation suggests that preoperative treatment leading to a perfect elation of cases and knowledge of and gratification to all the details in the operative procedure has influenced profoundly the results of surgery.

The preoperative treatment and the details of operative procedure and postoperative treatment are discussed in detail.

JOHN E. KIRK, JR., M.D.

ESOPHAGUS AND MEDIASTINUM

Rosan J. Infantile Meg esophagus (Megacystis infantilis) A. H. A. G. J. Form. J. D. G. 1944 9 409

The author recently reported on a case of megacystis in a child seven years of age. At the age of nine months had begun to have dysphagia and vomiting. The case is illustrated with a photograph of the child and radiographic films. Megacystis is frequently confused with esophageal spasm of the cardia or lower portion of the esophagus.

The author has collected 77 cases from the literature. Four of which were rejected as doubtful. The other 63 contain definite cases. Brief histories of these cases are given with a table showing the details of symptoms, treatment, and results.

Megacystis may be associated with infants and grad liv in other children. The chief symptoms are dysphagia, vomiting, and pain. The vomiting is esophageal; the food does not reach the stomach. The food is not contained in the stomach. Inspiration of the contents of the esophagus into the bronchi may cause bronchitis or sometimes abscess of the lung or emphysema. These children may be treated with a mustard solution of bromine or cure with anticholinergics or pulmonary tuberculosis. Sometimes the shadow of the dilatation of the esophagus reaches into the mediastinum and leads to a diagnosis of traumatic diaphragm.

Diagnosis may be made clinically by catheterization of the esophagus, copy or roentgenography, or autopsy. The best method of diagnosis is by roentgenography.

The best method of treatment is by dilatation on with a rubber bulb filled with water. The technique of which is described. This method has been used satisfactorily. See also at the Mayo Clinic.

A. REX G. MOORE, M.D.

Hansen L. Mediastinal Emphysema J. Am. M. 1944 9 409

A may reach the mediastinum by various routes (1) along the fascial planes of the neck (2) through perforation of the trachea or bronchi (3) esophageally into the mediastinum (4) from the retroperitoneum (5) from the intercostal spaces (6) from the lung. It has also been suggested that a may reach the mediastinum through a passage between the parietal pleura and the chest wall or between the visceral pleura or the air may pass from the pleural cavity to the mediastinum.

When air reaches the mediastinum and is confined there it will gradually be absorbed. When air is under pressure it will pass howe air always escapes from the mediastinum. The amount of the pressure in the thoracic cavity is not the same as the pressure in the atmosphere. The air escapes easily from certain locations and with difficulty from others. When air does escape from the mediastinum it may follow one of three paths: (1) into the subcutaneous and deep tissues of the neck (2) through the diaphragm into the retroperitoneal tissues and (3) into the pleural cavities.

A small amount of air in the mediastinum may produce only trivial symptoms. A large amount may cause a very grave disturbance. The effects of the increased mediastinal pressure are similar to those of increased intracranial pressure. As the pressure rises the collapse of the flow of blood into the heart is hindered and if the pressure is sufficiently high the circulation of the blood comes to a standstill. As the circulation becomes impaired dyspnea and cyanosis appear and later pulmonary edema develops. The symptoms are:

The signs of mediastinal emphysema are: (1) physical signs: (a) subcutaneous and retroperitoneal emphysema (2) obstructive cardiac dullness (3) pericardial dullness (4) evidence of increased mediastinal pressure—dyspnea, cyanosis, engorgement of the neck veins, and (5) rales in the lungs. (6) pulmonary edema and (7) retroperitoneal emphysema. The signs of mediastinal emphysema are: (1) physical signs: (a) subcutaneous and retroperitoneal emphysema (2) obstructive cardiac dullness (3) pericardial dullness (4) evidence of increased mediastinal pressure—dyspnea, cyanosis, engorgement of the neck veins, and (5) rales in the lungs. (6) pulmonary edema and (7) retroperitoneal emphysema.

A small amount of air in the mediastinum is so common that it is not always treated. When it becomes a symptom it may be treated by aspiration. The results are: (1) physical signs: (a) subcutaneous and retroperitoneal emphysema (2) obstructive cardiac dullness (3) pericardial dullness (4) evidence of increased mediastinal pressure—dyspnea, cyanosis, engorgement of the neck veins, and (5) rales in the lungs. (6) pulmonary edema and (7) retroperitoneal emphysema.

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SAMUEL KARY, M.D.

MISCELLANEOUS

Barrett N. R. Diaphragmatic Hernia J. Am. M. 1944 9 409

The report then cases partly because the diagnosis is difficult because of the small size of the hernia and partly because the lesions are small and partly because the lesions are small and partly because the lesions are small.

A man aged thirty six was admitted to the hospital because of increasing dyspnea on exertion over a period of six months. He also complained of intermittent epistaxis behind the lower end of the nose, but there was nothing to suggest presence of the angina type. Roentgenographs of the chest revealed an opacity about the size of an orange situated in the right chest at the level of the aortic arch between the right border of the heart and the dome of the diaphragm. The mass lay in the extreme front of the chest immediately behind the sternum. The bronchial tree as shown by the normal hy bronchoscopy and bronchograms and the diaphragm was not paralyzed. The electrocardiogram was normal and the possibility of a diaphragmatic hernia (through the foramen of the internal mammary artery) was not great because roentgenographs of the stomach showed no pathology. Operation was decided as to whether the mass could be held to explain the man's symptoms or whether the symptoms came from the mediastinum. The patient died in the lung with pleural effusion.

Artificial pneumothorax. This case is a typical example of the type of the lung retraction without the mass and in the case of cysts which may occur in connection with the parietal pleura that the utility of the mass alters after aspiration introduced into the pleural cavity. This method of investigation is not very satisfactory when the opacity lies adjacent to the mediastinum because the gas is attached to the central structures by the pleural ligament and it may not come to a mediastinal tumor even if adherent to the presutural. Artificial pneumothorax can sometimes be successfully combined with pneumoperitoneum and thoracocentesis purposes of diagnosis. In this case pleural effusion was decided in this case but it cast additional light upon the diagnosis upon the point of origin of the mass. The anterior was performed and rechecked as a test case. The right pleural cavity was opened by a short incision. The mass was immediately located lying horizontally in front of the pericardium in the pleural cavity. It was easily situated in this respect. It was a thin-walled translucent cyst which contained a watery fluid. The cyst was removed with difficulty and the chest was closed. At the operation the aspirated from the pleural cavity so that the pneumothorax remained. The result was a successful one. Such cases should be fully investigated in the modern cysts and at the mass of the mediastinum.

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3 This tumor grew from a relatively mobile into a pedunculated projection which occupied the whole of the upper lobe below this particular arrangement is peculiar in that the pedicle was much longer than its stalk.

4 In spite of the fact that the pleural cavity was contaminated by pus during the mobilization of the upper lobe and the chest was closed with uterine suture at the end of the operation the patient did not develop empyema.

While convalescing from catarrh of the jaw a three-year-old boy was said to have developed a left pleural effusion. The signs indicated a solid rib fracture on the right side of the third rib above to the dome of the diaphragm below. X-rays confirmed these signs and also showed that the heart was considerably displaced into the right chest. A bronchoscopic examination under general anesthesia of the bronchi of the left lower lobe was displaced posteriorly and a double intra-arterial bronchial abnormality was detected. Bronchograms did not afford additional information except that they confirmed the position that the lesion was extrapulmonary. The most likely diagnosis was considered to be a mediastinal tumor. One of the various possibilities the lobulated outline suggested teratoma or a benign tumor such as lipoma. The patient was given general anesthesia. The tumor lay in front of the heart and extended along the diaphragm to the lateral chest wall. It was yellow in color, lobulated solid and with a mass of small secondary cysts upon its surface. Removal of the tumor was not difficult. The chest was closed without drainage. The patient in the pleural cavity bled but aspirated the general condition improved rapidly. Histologically the tumor was lipoma.

A fifty-year-old woman was admitted with complaints of odynophagia, dysphagia, and a feeling of heaviness in the right chest during the previous months and increasing weakness. Examination of the chest showed a large tumor of the lung had been made. Roentgenography of the chest showed a mass in the right chest. Bronchoscopic examination showed a mass in the bronchial lumen. The mass was a firm, fleshy mass. The patient died of an embolism. The patient was a good health. The pathological report was mixed carcinoma of the lung. The tumor was a firm, fleshy mass. The patient died of an embolism.

JOSEPH K. NAX, M.D.

Thornton T. F. J., Adam W. E., Bryant J. E. and Carlin L. M. J. The Use of Whole Blood Transfusion in Resection of the Lung. *J. Thorac. Surg.* 1945, 4, 76.

Recent reports have called for a change in the use of massive blood transfusion in patients undergoing

radical surgical procedures. The dangers in cardiac and thoracic surgery seem to be two—first, postoperative pulmonary edema.

Dog experiments have shown that if from 5 to 10 g of sodium citrate per kilogram of body weight is given less than fifteen minutes fatal to the recipient are apt to occur. If the administration time is 15 to 30 minutes, the animal is almost impossible to resuscitate. Under ordinary conditions a patient who has received blood containing 2 g of sodium citrate per kilogram would be necessary then to give a minimum weight of 50 kgm 2500 c.c. of blood in fifteen minutes or less to permit the fatal dose of sodium citrate to be administered. This analysis is in rats is almost impossible in man and a 500 mg of sodium citrate per kilogram of body weight could be given by the use of calcium.

Gibson and his co-workers suggest that if the extent of resection of the lung when the patient is given pulmonary embolism is likely to occur and they presented clinical cases in which a load of circulation probably resulted in pulmonary edema following lung surgery. These men report that this clinical impression by a series of well-controlled experiments in cats. This article presents similar observations on dogs.

The authors are interested in the use of massive blood transfusions and believe that the liberal use of blood transfusion is a conservative blood loss has made possible the radical surgical treatment of certain diseases such as carcinoma of the esophagus in which the operations are long and attended by considerable blood loss. In the case of esophageal cancer, the removal of blood is so difficult to be placed as quickly as possible by whole blood transfusion shock to the patient is more likely to be fatal than the use of plasma.

Plasma is a glucose solution and does not supply the despotically dried red cells and dilute the circulating blood that remains. The authors published data on 11 blood transfusions. The authors report that the whole blood was 947.8 c.c. and 500 ml of citrated plasma was added. The authors report that the whole blood was 947.8 c.c. and 500 ml of citrated plasma was added. The authors report that the whole blood was 947.8 c.c. and 500 ml of citrated plasma was added.

For the purpose of the experiments carried out in the first 8 days of the study of the total plasma content of the blood of the patient. The authors report that the whole blood was 947.8 c.c. and 500 ml of citrated plasma was added. The authors report that the whole blood was 947.8 c.c. and 500 ml of citrated plasma was added. The authors report that the whole blood was 947.8 c.c. and 500 ml of citrated plasma was added.

loss averaged 20 c.c. and following operation the ed count consistently was elevated 500,000 cells with a corresponding increase in hematocrit and hemoglobin.

In the second group 8 dogs were subjected to lobectomy of the right lower and accessory lobes which was followed by a transfusion of 15 c.c. of citrated whole blood per kilogram of body weight. Approximately one month later the left lower lobe was resected and a similar transfusion given. The stage of lobectomy was well tolerated. One dog died 5 days after the second stage of extensive mediastinal and subcutaneous empyema. Two dogs died of terminal edema 2 days after operation on a terminable cause. Transfusions were given even from twenty six minutes and were not followed by pulmonary edema. As in blood counts similar to that in the first group was seen.

The dog (group 3) submitted to lobectomy of the right lower the accessory and the left lower lobes at once and then transfused with 30 c.c. per kilogram of citrated whole blood. Six of the dogs were transfused in ten minutes (in from ten to fifteen minutes) and the other 6 in from three to six minutes. Of these ten to fifteen minutes group 4 died in from two days to two weeks of various causes, but none developed pulmonary edema. Microscopic section showed congestion of the pulmonary vessels but no edema. The results were kept in the blood counts occasionally as much as 1,000,000 red blood cells. Five of the 6 dogs in the group which were transfused in from three to six minutes developed pulmonary edema and died in one or two days. At autopsy the trachea was full of bloody frothy and blood tinged fluid escaped from the cut sections of the heavy soggy red lungs. Microscopic sections revealed extensive edema fluid in the interlobular spaces.

In the fourth group the operation and transfusion were carried out as in group 3 with the addition of blood. Six dogs were bled 25 c.c. per kilogram of body weight (50 c.c. less than the amount of the transfusion). The bleeding was carried out in the femoral artery while a transfusion was running to the femoral vein. The plan of this experiment was to avoid overtransfusion. The authors believe that the blood loss in bilateral lobectomy probably was about 50 c.c. Of the first 6 dogs (group A) 1 developed pulmonary edema and of group B 2 dogs developed pulmonary edema. All transfusions were given in less than ten minutes. The authors believe that the dog that transfused on her tend to sum the total of blood loss and replacement.

One must carefully apply data obtained from dog experiments to human clinical practice. In addition to the basic physiological differences between dogs and human beings certain conditions peculiar to this experiment must be considered. These factors must be kept in mind in interpreting the findings.

1. Blood loss in dog surgery is minimal compared to hemorrhage in similar operations in patients. All animals except those in group 4 were veteran fuses.

2. These experiments are unusually rigorous. Clinically bilateral lung resection is done at staged operations at monthly intervals. The amounts of blood used here were not excessive but were given in a very short time.

3. The remaining lobes in dogs are normal. Hence frequently in clinical suppuration and sepsis of the lung the upper lobes may contain residual abscesses.

4. We have no accurate measurement of the degree of anemia that developed in the animals that survived.

Goldman has shown that animals subjected to lung resection do not tolerate large transfusion as well as do normal animals. The authors believe that in addition to the amount of lung resected there are other factors are present.

Obviously the amount of blood given will determine whether edema develops.

2. The time of transfusion is extremely important at least experimentally. Clinically this may not be important since blood is given considerably slower in most instances.

3. Overtransfusion tends to promote edema. If a transfusion no matter how large is given to replace hemorrhage in a reasonable period of time or simultaneously with the hemorrhage pulmonary edema is probably not encountered in the presence of effective cardiovascular or pulmonary disease.

When a patient's status is severe hemorrhage in actual practice blood may not be available for immediate replacement. Then large amounts of saline or glucose solution in plasma are administered until blood is obtained. If no intravenous therapy is given the animal will die. Later the blood is transfused. Then a few hours later blood is given in the amount of the hemorrhage and the circulatory system is overloaded. The heart may fail and edema of the lungs occurs. It is not a matter of how much blood is given because any fluid in sufficient amount will overload the heart. However if large amounts of blood substitutes are given over a long period of time the volume of blood given

R. E. R. B. E. L. W. M. D.

SURGERY OF THE ABDOMEN

GASTROINTESTINAL TRACT

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Many efforts have been directed toward an early recognition of carcinoma of the stomach. Even with a vast panoply of methods, roentgen diagnosis is a most general use of gastroscopy, more extensive methods of examination of the gastric contents and stool, the summation of results is difficult again. The salvage of but 2 per cent of the patients afflicted with this disease is seen in the survival of 6 per cent the maximum reported gives some idea of the difficulties involved.

The incidence of gastric carcinoma and the absence of striking symptoms even in advanced tumor are some of the difficulties to be surmounted in establishing the diagnosis. Roentgen examination is generally considered the most accurate procedure, yet the diagnosis of malignant tumors is frequently overlooked. In support of this view the authors cite a post-mortem of the stomach of a patient with pernicious anemia demonstrating a benign polyp 4 mm in diameter. The lesion was not seen on first roentgen examination but was found gastroscopically and then demonstrated on re-examination. In all probability many such lesions escape detection.

In an effort to test the accuracy of the roentgen method in symptomless individuals it was deemed reasonable to examine a selected group of persons in whom the incidence would likely be higher than in a group of persons selected at random. The authors selected a group with pernicious anemia since a review of the literature seemed to indicate that these patients would offer the most productive results. Accordingly, in 1939 they undertook the roentgenological examination of 11 patients with pernicious anemia at a certain interval.

The coexistence of pernicious anemia and carcinoma of the stomach has been studied statistically since it was first observed by Quincke in 1864. Numerous reports have appeared as well as studies of clinical cases and a few autopsy series. The association of pernicious anemia with carcinoma seems to be a well established fact but there is a difference of opinion as to its frequency. An increase in the coexistence of the two diseases is noted and is best illustrated by the various reports from the Mayo Clinic during the last twenty years. These results may be deemed partly the better recognition of gastric tumors but may also be due to the increased frequency of patients with pernicious anemia resulting from the institution of therapy. In the case reports there is a vast preponderance of findings in which malignant tumors are discovered at the same time after the disease is well established. Coincidence with the discovery of the pernicious anemia

The data presented in a large number of studies indicate clearly that an etiological rather than an accidental relationship exists between pernicious anemia and tumors of the stomach. Most investigators have concluded that there is a common precursor of the two diseases. Numerous studies point to a hereditary or familial deficiency which predisposes to both diseases.

Another phase of the problem deserves special attention namely the relationship between polyps of the stomach to pernicious anemia and also to carcinoma of the stomach. Various investigators have found that benign polyps rarely occur in patients with carcinoma in patients with pernicious anemia. Little doubt exists that many benign epithelial tumors of the stomach may develop into cancer. The evidence of the discovery of polyps of the stomach has greatly guided a more effort to detect and remove the multiple foci of carcinoma of the stomach. The discovery of polyps of the stomach has greatly guided the detection of the malignant disease. The possibility of the malignant disease of the stomach may be partially borne out in the incidence of pernicious anemia because of the tendency of the latter to develop carcinoma.

The present report concerns a roentgen study of patients with pernicious anemia. Roentgen examinations of the stomach with barium meal were made. In approximately 30 per cent of the examination was made usually at the time the anemia was discovered. In the remaining 70 per cent multiple examinations were made usually semi-annually. Faintest findings were made in all patients with carcinoma but all benign polyps.

The theme of the diagnosis of pernicious anemia was established in these cases by blood means, bone marrow studies, the presence of glossitis, the findings of bacitracin, and the clinical and hematological response to the therapy. Gastroscopic examination was made in many of these patients and all of them the gastric contents and tools were carefully studied. Almost all of the reports of carcinoma were confirmed by surgery or by autopsy. Many of the benign tumor cases were likewise confirmed. The results of the study showed that carcinoma was found in 8 per cent (7 patients) and benign polyps in 7 per cent (5 patients) of the cases.

In an autopsy study reported by Lewin and others 23 per cent of the patients with pernicious anemia were found to have carcinoma of the stomach.

Outstanding features which characterize the findings in this series are (1) the rapid change in benign polyps to cancer (2) the presence of both benign and malignant tumors (3) the absence of symptoms in the presence of late tumors and (4) the development of a small

barely detectable lesion to an extensive inoperable carcinoma

1 The rapid change of form a benign polyp to a malignant tumor well illustrated in a patient with a progressive pernicious anemia through gastric polyps to a fully blown gastric carcinoma

2 In a number of cases sections from two portions of the same gastric polyp removed surgically from a patient with pernicious anemia showed a typical benign papilloma on one portion and a typical invasive carcinoma in the other

3 The significance of cases of gastric cancer with uterine symptoms by gynecologic surgery of the tumor by routine procedure in patients with pernicious anemia has been strikingly illustrated in a number of instances and is gratifyingly reflected in this study. The authors introduce an interesting case history in which the patient had no gastric symptoms while the further questing after the discovery of the ray findings indicated complaints referable to the uterus. This case history of patients with benign polyps and the less frequent but in many instances in origin although malignant degeneration had already occurred. These cases strikingly demonstrate the usual equivalence in early atrophy of the gastric mucous membrane with pernicious anemia being polypoid and adenocarcinoma

4 The development of form similar history of cases of lesions of the uterus as inoperable carcinoma was illustrated by a case which showed the ultimate outcome which attends the failure to repeat the examination. When first among the findings were not sufficiently definite to justify surgery and unfortunately the patient did not turn for examination semiannually. When examined roentgenologically as a routine procedure two years later the patient presented an extensive polypoid carcinoma of the stomach. Surgery was taken but the terminal metastases followed. The tumor was of the bulky type and measured a considerable length. At no time was the gastric distention with gas more than minimal. Had the examinations been made at intervals the tumor would have been all right. The lack of symptoms was striking in the entire group of patients. The author refers to an instance in which a patient had a gastric polypoid lesion and the hemoglobin as good percent though a normal blood-cell count and yet lesions with adenocarcinoma metastases followed. The diagnosis was arrived at by means of the histologic gram which demonstrated the tumor.

It would appear from the study that the minimal roentgen examination of the stomach in patients with pernicious anemia is a highly productive procedure. It does not have a representative decrease in the prevalence of gastric carcinoma from the time in other cases of pernicious anemia of the patients who die of pernicious anemia. The authors indicate that this result obtained in this study points

the way toward a more general utilization of the roentgen examination of the stomach in patients with pernicious anemia who might be likely to develop carcinoma. If for instance all individuals with achlorhydria were examined and repeated by it might be possible to obtain a large saving.

M. M. S. J. Serre, M.D.

Lanning B. G. E. Peimant, E. A. L. T. N. f. Sati
History of the Operation of the Ulcer. S. G. 945
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Studies on the effectiveness of various types of operative procedures in preventing the development of ulcer are performed in animals subjected to implantation of histamine and heparin mixture creamed. The normal ulcer may be produced by a variety of methods but the majority of them involve alteration of the normal alimentary physiology. The normal alimentary system of the stomach on the experimental induction of ulcer indicates that the development of a simple gastric ulcer is not provided the best means of producing a typical chronic duodenal ulcer. Gastric ulcer consistently in the animal. Further the procedure of duodenal ulcer suggests that the stomach plays a negligible factor in the causation of ulcer. The success of an ulcerated gastric ulcer. The primary result of a satisfactory procedure of ulcer therefore is a successful reduction of the gastric acidity. By employing the Goddard method for production of ulcer the author could evaluate the protective influence of various operative procedures commonly used in the surgery of ulcer. An attempt is made to correlate the primary histological changes in clinical data also. A reliable therapeutic ulcer is presented in the group of cases with the type of operative procedure employed.

Group C. The jejunojejunostomy as performed in a dog. Late the very evening the histamine was implanted in the ulcer developed in all of the animals and a dog died from peritonitis due to perforation of the jejunum. The histamine is applied to the peritonitis offers no protection against the development of ulcer but the histamine appears to expedite its occurrence.

Group 2. Gastric resection and a trial of the operation. The operation consisted of resection of the normal gastric portion of the stomach which comprises 25 to 30 percent of the total area. The study was then established by gastric jejunostomy with Bill's II type ulcer. The ulcer developed in all animals. The operation is indicated in the gastric acidity adequately and must be considered satisfactory clinically. The conclusion is that these findings.

Group 3. Extensive gastric resection on which the results of gastric acidity and the subsequent recurrence of the ulcer are the results of the ulcer. The procedure provides adequate gastric capacity without apparatus to be satisfactory peritonitis. The procedure was studied with effect of the distal portion of the stomach. The ulcer was healed in all animals with the first portion of the jejunum and the results of the lesser curvature are according to the histological picture. The

operation completely protected the dogs against the development of experimentally induced ulcer. It is clearly indicated by clinical and the experimental evidence that a short afferent loop contributes to the protective procedure by the operation. Thus, extension of the quarter resection with a short loop as a stoma would appear to be the most satisfactory procedure.

Group 4. The Finsterer antral exclusion with excision of the antral mucosa was found to be as acceptable as the three quarter resection. This procedure is of value in dealing with so-called inoperable duodenal ulcer and varies from the extensive excision only in the technique of managing the distal stump.

Group 4. The Finsterer antral exclusion without excision of the antral mucosa protected 4 dogs against ulcer but erosions in the gastric pouch were more numerous than in Group 3 and 4a procedures. Although the experimental evidence does not conclusively indicate evidence indicates that this procedure would be abandoned in favor of the Group 3 and 4a operations.

Group 5. Atral resection plus total intragastric gavage technique (Schminsky procedure) was found to be operation rather than to protect against the development of jejunal ulcer and is to be recommended.

Group 6. Fundusctomy with gastric jejunostomy appeared to furnish satisfactory protection against the development of jejunal ulcer in dogs. Clinically, however, the gastric capacity is less adequate than that following the Group 3 and 4a procedures since the most distal portion of the stomach is removed.

Group 7. The operation in this series approximated Connell's original procedure and was done on 4 dogs. The procedure offers less protection than the procedure of excision of the so-called developed duodenal ulceration and the others developed marked erosions and gastritis. None of 5 patients in whom this operation was done became chlorhydric and symptoms from the ulcer continued in 2 of them. The procedure is found to be completely inadequate with the Group 3 or 4a procedure and the clinical indications for such a procedure would be much limited.

Group 8. Hem gastrectomy. It appears that this operation does not furnish adequate protection. An occasional ulcer which might develop in the stomach procedure outweighs the importance of gastric function which might follow the more extensive resection.

Conclusions. The evidence indicates and modified the exclusion with total intragastric gavage technique. These procedures are proved unsatisfactory and are to be condemned.

Group 9. The evidence indicates that the gastric resection. Although the experimental evidence does not conclusively indicate clinical limitations of such an operation, the procedure are obvious.

A member of the committee which is satisfactory operation must fulfill requirements. A satisfactory procedure of gastric secretion must be accomplished—

this necessitates the sacrifice of an extensive amount of gastric tissue including the antrum and lesser curvature. The manner of duodenal resection with or without removal of the ulcer is of no great consequence but the antral mucosa must be removed. Although the experimental evidence favors the Edkins hypothesis of colic evidence of the afferent loop indicates clearly the importance of the antral mucosa. The stoma is with the jejunum must be made so that the afferent loop is as short as possible. The short proximal loop is indicated by clinical evidence and by the possibility of the secretin factor and decreased tissue resistance to ulceration with a long loop. Extensive three quarter resection including the antrum and distal stomach antral mucosa and stomostomy with a short proximal jejunal loop has been done clinically in 300 patients with a significant incidence of recurrent jejunal ulcer.

J. H. L. L. D. Q. T. M. D.

De Azedo Sod e J. P. Treiman et al. Peptic Ulcers by Excision of the Gastric Mucosa. (Tratam. to das úlceras pépticas por da peção da gástrica mucosa.) *Rev. Bras. Cir.* 1944, 3, 65.

In the emergency hospital in which the authors have performed the surgical service 30 cases of perforated ulcer of the stomach and duodenum were seen from August 1938 to August 1944. These cases in all of which the ulcer had perforated into the peritoneal cavity a linear resection of the stomach and duodenum was performed with frame fixation of the stomach and duodenum. A pedicle of the stomach was transferred to the duodenum and the stomach was anastomosed to the duodenum. In all cases the patients survived. In 4 cases the patients died of appendicitis. The patients recovered and died of mortality of 0 per cent while the mortality of the patients who were quoted from the literature was 10 per cent. The patients who died of death occurred.

Among these 40 patients with perforated stomach 13 returned later with recurrent symptoms of ulcer. Evidently the ulcer was healed but had not put a stop to the progress of the ulcer. Although clinical diagnosis of perforated ulcer is difficult roentgen examination was most satisfactory and showed pneumoperitoneum. The perforated duodenum recurred in 3 of the cases (cases of recurrent perforation have been reported). Of the 3 patients that returned to be operated on by gastrectomy and 2 by gastroenterostomy. The patient was given medical treatment. The patient with gastric stoma described a duodenal ulcer in 13 cases. Roentgenograms, photographs of the operation, specimen and plain roentgenograms of the histological findings are also given. The authors conclude that the mortality of the patients who died of treatment of perforated ulcer is

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Fraser K. Malignant Tum fth Small Int
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Ray hav a r v def ite pla s n d to d g
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operati mortality w s 50 per cent a d for the e f
sarcoma it was 75 per ce t

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high freque cy of meta t s

JO F K NA MD

Crymbl P T UI fth Sec d P rt of th
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s en th r ente ogram Po te or g st cent
ostomy wa perfo med

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tio Jo hn K n M D

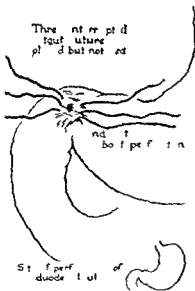
Graham R R s d T E B Th Tr sm at
of P r f rated Duod n l Ul e S gr 945
774

This c mm scati n d al with th t eatm nt f
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Fig

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Fig

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forato J g L Li nq MD

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M l H m rrt g f m Du d n f UI rs f
P t t B j d Middl Ltf i S z 945
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Ampl e d ce has b cu l t l t mpha
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Cutl G D St k R B d Sc it H W Jr
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Pr mary j l ms f th intest e ar t r mly
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life. Except for adenomatous polyps most testicular tumors in early life are sarcomatous. Lymphosarcoma is one of the more frequent types. In this group four cases of lymphosarcoma and one case of teratocystic sarcoma of the intestine treated at the Children's Hospital Boston during the last fifteen years are reported.

Lymphosarcomas may remain temporarily localized to the intestinal tract but ultimately they invade and metastasize as malignant neoplasms. These tumors arise in the lymphoid follicles of the submucosal layer of the bowel and infiltrate the lymphatics leading to remittent or tramural adenotendinitis. Gross and coarseness only as a relatively late change. The reflex large lungated masses completely envelop the bowel may develop in the intestine. Intestinal obstruction is caused by fibrous white suberosive plaques. Tumors frequently umbilicated and frequently multiple. Progress is usually early stage. The process is bilateral. Extension may cause diffuse thickening and dilatation of segments of the bowel.

The patients were all males. The ages of the patients varied from four months to ten years.

The symptom was the onset of any intestinal tumor causing obstruction—abdominal pain, anemia and constipation being most frequent and occasionally associated with fatigue and irritability. On examination an abdominal mass was noted in 3 cases which operation proved to be an intussusception of tumor in 3 cases. The frequency of intussusception is not tabulated. It occurred in 3 of the 5 patients. The youngest patient in the group was a four-month-old baby who had the symptoms of intussusception and at operation was found to have intussusception in the ileocecal type caused by small lymphosarcomas of the terminal ileum. The older patients six years of age had cesarean section followed by three months respectively which led to fecal impaction. On these patients dehydrated cut testis lobectomy a few days before hospitalization and by means of a barium enema was found to have an ileocecal intussusception associated with the tumor of the terminal ileum. The patient had a chronic intussusception extending from lymphosarcoma of the cecum and ascending colon. In the fourth patient seven years of age the abdominal complaint led to examination on which the large hard mass filling the right side of the abdomen. Blood in the stool was the complaint in the last patient two years of age who had a teratocystic sarcoma of the cecum.

Examination of the blood revealed no abnormality in any of the 5 patients at the time of diagnosis. Terminally however the blood picture was lymphoblastic.

The operative procedures and course of the 5 patients were as follows.

In the four-month-old infant the ileocecal intussusception was reduced by the segmental ileum cauterizing the two small lymphosarcomas and a lateral anastomosis performed. Two years

old the patient operated on the infantile type of the picture of acute lymphoblastic leukemia and died.

A five-year-old child with a terminal ileum carcinoma a large tumor was performed. The second patient with an intussusception. The tumor extended to the sigmoid and root of the mesentery and small tumors were noted in the prosmall intestine and jejunum. Recurrent intussusception occurred on necrotic and laparotomy Roentgen ray therapy (1,350 roentgens) was given during the fifth week lymphoblasts appeared. The blood smears showed masses of tumor within the abdomen. The child died in the thirty-ninth postoperative day. Autopsy revealed generalized metastases.

The chronic colocolic intussusception was unducible. There were many large nodules. The omentum was removed for biopsy. A ileotransverse colostomy was performed. Roentgen ray therapy (600 roentgens) was given. The child died nine weeks after operation.

In the fourth case a large tumor of the cecum and ascending colon was excised and the large ileocecal mesenteric lymph nodes. A biopsy of the tumor performed. Death occurred in the sixteenth postoperative day.

A abdominal neoplasia of the rectum and lower sigmoid was performed in the last case. Several large nodules in the mesogastrium were used. The tumor (teratocystic sarcoma) lay in the ileocecal region. A total of 13,000 roentgens was given. The patient was discharged thirty-five days after operation. The child has remained well for fifteen months and is the only child in the group.

The authors opinion combined of radical surgical extirpation of the intestinal tumor and mesenteric lymph nodes by the use of roentgen ray therapy of the abdominal lymph nodes and drainage of the rectum at the optimal time. The use of roentgen rays in such cases may have helped to prolong the survival of the child.

F. E. F. A. M. M.D.

B. H. D. M. Col. N. S. R. G. R. J. M. M. I. 15

The use of the midsection of the colon. Good results. The first patient at least a week prior to operation. With a primary pig and liquid diet the patient's health improved. We greatly reduced the addition of the blood transfusion.

The best results were obtained with the use of the doses of the treatment. It reduces the number of coliform bacteria per gram of stool. The use of the treatment can be considered a valuable procedure.

Succinylthiazolide would be given in a gram per kilogram of body weight.

reek before operation. Colonic irrigations are of
 necessity because the drug has the property of di-
 minishing the content of the intestine to act r-
 moving it practically empty. The admission that no of-
 ficial bulbar azole makes the use of various as-
 pect reduced unnecessary in colon to colon anasto-
 mosis. S. M. K. A. N. M. D.

P. L. R. M. Jr. Surgical Treatment of Congenital
 Megacolon. *J. Am. Med. Assn.* 1945 128 43

Congenital megacolon is an uncommon little
 understood condition in which has challenged the med-
 ical profession since Hirschsprung's report. Little is
 known of the etiology of this disease hence any plan
 of treatment becomes at once vulnerable to adverse
 criticism. Nevertheless some plan of management
 is desirable and may possibly be useful even though it is
 necessarily tentative. The literature on the subject
 is confusing and difficult to evaluate. Many articles
 consist of isolated case reports describing treatment
 but they show follow-ups of only a few months.

In the present article the author attempts to cor-
 relate his experience in management of cases of
 congenital megacolon with the results of treatment
 of this disease in the hands of others. No reports of
 single cases have been included. The results in pa-
 tients on whom full bowel sympathectomy was
 performed by the surgical staff at Tulane University
 School of Medicine and the Ochsner Clinic have
 been compared with results following this and other
 types of therapy previously reported.

In conjunction with this study a careful survey of
 the records of two large general hospitals in New
 Orleans was made over a five year period of fifteen
 years. All cases in which diagnosis of megacolon
 questionable megacolon appeared were carefully
 reviewed. About 30 such cases were found. In most
 instances the diagnosis was not established although
 the case was frequently roentgenographically evid-
 ent of dilatation and the clinical findings were in
 complete agreement. Usually a few days of enteric
 treatment in the hospital sufficed. The subsequent
 course of the patients is not known. It is signif-
 icant however that there were only one reoperation
 in 30 cases. The author infers that mild forms of this
 disease are usually treated successfully and that only
 the unusual impact occurs.

The condition of these patients treated by sym-
 pathetic myotomy however definitely supports the diag-
 nosis of congenital megacolon. The results of
 the operation were performed in any doubt as to the
 nature of the disease existed if the medical history
 that medical management would probably satisfy.

A variation both as to symptomatology and to
 the condition of the intestine is met with in the
 severe forms of megacolon. This was admitted in
 10 patients treated by the author. In 10 of these
 patients no need of dilatation of the sigmoid was
 met by any of the various methods of medical
 management. In the remaining 10 cases the sigmoid
 was found to be abnormally dilated and the descend-

ing rectum was not dilated. A period of four years
 Roentgenographic studies showed the undilated
 colon to have an abnormality to expel material from
 its lumen. The remainder of the spastic colon was
 affected. Massive dilatation of the terminal ilium
 developed later. Many writers confirm the con-
 siderations regarding the site and extent of involve-
 ment. These varied clinical types of megacolon do not
 have caused considerable confusion in evaluation of
 methods of treatment.

The diagnosis is to be carefully established by
 adequate observation and study of the patient.
 Medical management utilizing the sympathetic
 stimulants is recommended for a trial of from eight
 to ten weeks. Results with meclocholylamine
 administration orally have been promising. Ben-
 zocaine effects have likewise been reported with the use
 of syntropan. An atropine-like drug which acts as a
 parasympathetic paralytic. Both of these com-
 pound have opposite effects. Since both go to
 the intestines would seem to support the often ex-
 pressed contention that a peripheral rather than a
 central is the fundamental fault.

Drug therapy must be accompanied by a careful
 regimen of the bowel function. Particularly in the
 first months of treatment a therapeutic test
 with cetylcholine spinal anesthesia should be
 carried out in each case. There is evidence that
 that the rape test is a extremely valuable
 Spinal anesthesia is definitely known to have be-
 neficial effects which first permit of sometime. Anes-
 thesia obtained in this manner usually results in a
 large bowel evacuation sometimes several such
 evacuations with the following thirty to four hours.
 This result would indicate that the powerful
 effects and the effect regarded as a good result in
 particular if sympathectomy could be done. While
 the present status of information does not warrant a
 definite opinion on the failure of spinal anesthesia to
 effect spontaneous evacuation is probably closely
 associated with failures in surgical intervention.
 DeTours who has made a exhaustive study of
 case of congenital megacolon is of the opinion that
 an atrophic bowel wall makes the test proper
 at least should determine this factor. If ad-
 ministration of the barium enema fills well by the
 injection of a spinal anesthetic is acetylcholine
 bromide. Fifty-five minutes later a film should be
 made to determine the extent of the evacuation.
 DeTours believes that the use of the drug as er-
 andor rather than a spinal anesthetic especially if
 debilitated patients. The author believes that inad-
 vantage to subject patient less than two days if
 years if get any surgical procedure unless it is a
 life saving measure. Conservative management
 with high intensity saturation is the treat-
 ment of choice in infants.

If the medical regimen does not produce satisfactory
 and the age of three has been reached if sympathectomy
 should be considered especially if
 final anesthesia produces a copious bowel evacu-
 ation. Left lumbar sympathectomy is the simplest

Dmytryk, E. T. Congenital Malformation of the Anus and Rectum. A Clinical Study. *A. J. S.* 94:5 1953

Congenital malformation of the anus and rectum are said to occur about 1 in every 5000 newborn babies. Anomalies of the anus and rectum are classified by Ladd and Gross into 4 types as follows: (1) incomplete rupture of the anal membrane resulting in a point from 1 to 4 cm above the anus; (2) imperforate anus with the obstruction due only to a persistent membrane; (3) imperforate anus in which the rectal pouch may, and blindly, enter the abdominal cavity; (4) normal anus and anal pouch with the rectal pouch ending blindly. The treatment depends on the type of anomaly. In the first two types, a separation of the anal and rectal pouches, when the pouches are separated, is performed without a lumen. Occasionally, they can be corrected.

Fifteen patients with congenital malformation of the anus and rectum were studied by the author. Of these, 10 patients (53.3 per cent) had males and 5 patients (33.3 per cent) had females. The sex distribution showed 4 males and 1 female with a malformation of type 1 and 8 males and 2 females with a malformation of type 3.

Five of the patients were found to have fistulas connecting the rectum with the genitourinary tract: 2 perineal, 2 types of fistulas were encountered in the males, 2 rectovesical and 1 rectourethral. In the female patients, 1 had a rectovaginal fistula and 1 had a rectum-fossa navicularis fistula. In the rectovesical and rectourethral combinations, 1 rectovaginal and 1 rectovesical fistula were encountered.

Five patients had other associated congenital anomalies. These included absence of the gall bladder, horseshoe kidney, hydronephrosis, patent ductus arteriosus, anomaly of the retina, hypospadias, and an unusually large female and male gonads.

The treatment for the type 1 anomalies was satisfactory, as judged by the mortality in this group. Basically, the product of the colonostomy for patient with symptomatic intestinal obstruction and the performance of primary perineal plastic operation on patients who were free of obstruction. Two patients who had undergone primary perineal operations died of peritonitis as a result of perforation of the rectum and contamination of the peritoneal cavity. These were technical accidents. The symptomatic intestinal obstruction and peritonitis in the colonostomy were performed. One patient with type 3 anomaly was given a barium swallow as a diagnostic study. This is contraindicated for this condition as well as for any other type of intestinal obstruction.

The choice of anesthesia for infants is limited to either chloral hydrate or pethidine. The latter was used in all of the cases except 1 in which local anesthesia was used. JOSEPH K. NARA, MD

Smith, G. V. S. A Modification of the Old and Simple Method of Treating Rectal Prolapse. *E. J. S.* 94:5 1953

Few cases of rectal prolapse treated by a modification of compression amputation are reported. The author states that from a review of the literature he could conclude that amputation of the rectal process by constriction is not a good procedure. Since the last twenty years the case has been 2 operations, deaths among 4 reported cases. There has also been considerable morbidity as well as rectal stenosis during the period of observation on his patients. The patient too short to decide about the permanent cure. A fairly complete review of the literature of the last four years leads to the same conclusion. Concerning the various other methods of treatment, both abdominal and perineal. Either the morbidity or the mortality is similar to the advantage of the cure or good results are based on too short a period of observation. There is a note that surgical amputation has yielded the best results in the past.

The author suggests that the mortality diminishes with the constriction method. It appears to have come from technical errors and that this method would be just as effective as surgical amputation with the advantage of being much simpler procedure.

The procedure described is a method of gauging the technique. Old methods of achieving constriction involved ligatures or elastic bands and rubber tubing. The only original features of the present method is the cutting of the circular groove in the garden hose and building up a trough around it. In applying the constriction by twisting strong material between the protrusion of the circular groove 5 cm and cut deeply 4 cm from the distal end of the tube into the rectum. The rectal sleeve is drawn out of its ligament and carefully ligated to the perineum of small intestine. The herniated pouch is ligated. With the aid of lubrication, the patient is told so that the groove comes just distal to the anal ring. Compression of the bowel against the groove produces and the patient voids too early. The patient is told the end of the procedure is complete.

The mortality of blood and the short time required in the use of this technique and success of sulfazazole has diminished its greatest danger, namely sepsis.

Technical errors which appear have been attributed to the mortality diminishes with the constriction method of treatment.

The hose is inserted too far, both the point of constriction which allows the accumulation of feces between the distal end of the intestine and the anus. Some of this material, although weakened, is the tissues. This should be the first few centimeters of the hose above the point of compression. It is probable that in some cases translocation has not been complete while the peristalsis is great, septa and

try absorbent. A slight increase in the diameter of the hose might have reduced the amount of leakage which flowed in the author's cases.

In 5 cases of reducible rectal prolapse in women the procedure has been safe and the results in 4 cases have been good for periods varying from 5 months to 5 years. In the fifth case prolapse has twice recurred after 12 and 18 months respectively of temporary cure. It appears that there will be a small percentage of recurrent rectal prolapse.

JOHN L. L. BOGUE, M.D.

LIVER GALL BLADDER PANCREAS AND SPLEEN

Titlb. M. M. Curtis, A. C. and Goldh. M. S. M. Th. Comparat. & Val. Sev. Ill. F. Th. N. T. A. I. I. M. 1945. 653.

Eighty-five of the functions of the liver for metabolism, the amount on each of 53 patients with various types of liver disease, a disorder than 5 per cent of the incidence for various types of liver disease.

The various types of liver disease are grouped into five categories: (1) Urobilinogen, a pigment formed by the bacteria in the liver, is found in the stool. (2) The stool is found in the intestine. (3) The stool is found in the liver. (4) The stool is found in the liver. (5) The stool is found in the liver.

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abscess of the body of the pancreas as found which as necrosed and drained. The quadratic lobe of the liver on the inferior surface between the falciform ligament and the gall bladder was bulging and pulsating from this lobe of the liver. The lobe was incised and two abscess cavities were found and drained.

The postoperative course was satisfactory and the patient had not developed diabetes mellitus three months postoperatively. The authors interpret the suppurative pancreatitis as secondary to an acute hemorrhagic pancreatitis. The hepatic abscess they believe was probably due to bacterial invasion of the spleen vein.

E. R. O'LEARY, M.D.

Whipple A. O. P. necroticoduodenectomy for islet cell carcinoma. *A. S.* 1945; 847.

The author reports the first recorded on-stage removal of the head of the pancreas and duodenum with occlusion of the pancreas. This operation was

performed March 6, 1941, for an islet-cell carcinoma of the head of the pancreas. The patient has survived five years without evidence of recurrence of the tumor.

The author favors the on-stage procedure over his earlier two-stage procedure reported in 1935. He has found the following two steps of great advantage:

1. The implanting of the common duct into the jejunum at the duodeno-jejunal junction according to the technique of the loop or Roux type of jejunojejunostomy. This avoids the danger of a cholecystoenterostomy and the serious complication of a biliary fistula as a result of the cutting through of the ligament in the ligated common duct.

2. The implantation of the pancreatic duct into the jejunum at a loop below the choledochojejunostomy. This eliminates all the uncertainty and doubt regarding occlusion of the pancreas and possible fatty liver degeneration at

E. R. O'LEARY, M.D.

GYNECOLOGY

UTERUS

Jeff eate T N A nd Le r S Hypoplasia of the Uterus with Special Reference to Spasmodic Dysmenorrhea J Obst G B i Emps 1945 5 97

The authors present a critical analysis of hypoplasia of the uterus and its relation to spasmodic dysmenorrhea. This analysis is based on the case record of 89 patients complaining of dysmenorrhea. Only patients with a typical history of spasmodic pain are included. All cases in which associated lesions of the pelvic area were excluded.

Of the 89 patients 43 were single and 38 married. One hundred and twenty-five women complained of sterility.

The onset of menstruation occurred within normal limits in most of the cases. Only 3 per cent of the patients had scanty menstruation and the average lower degree of infrequent menstruation in the group reviewed.

Most of the uterine cavity measured 3 inches in depth. Some type of minor development abnormality of the uterus was noted in a large percentage of the cases. Acute anteversion of the cervix was found in 368 cases, congenital ectocervix and retroversion in 5 cases, a congenital cervical width or without perforation in 39 cases. The authors conclude from these figures that it is the malformation rather than the degree of development which is the factor causing the dysmenorrhea.

The endometrial patterns were studied in only 3 cases. However, the authors stated that the findings reported the view that menstruation characterized by pain is of the "rule" type.

In this series of 89 cases, 15 per cent of the patients had definite evidence of uterine hypoplasia, as found in only 15 cases, a diagnosis was questionable, a incidence of 3.38 per cent.

A discussion of the therapy of hypoplasia of the uterus with estrogen is given.

In summary, the authors state that the spasmodic dysmenorrhea is related in some way to contractions of the uterus. The difference between painful and painless contractions lies in the character rather than the intensity. The theory that suggests incoordination of different areas of the uterus or disturbed polarity of the uterus to be the cause of pain during menstruation has still to be disproved. Also, the uterus is not present in any evidence of pro or distal theory which proposes uterine hypoplasia to be the cause of the abnormal uterine contractions. Hax Field MD

Findl D End R Its in th Treatm nt f Cervicitis Am J Obs 94 49 6 4

Two hundred and forty cases of chronic cervicitis were treated by the three generally accepted methods

of electrocoagulation, namely, nasolip cautery, electrocoagulation and coagulation of the vaginal cervix. The treatment and after healing was clinically complete.

Comparisons were made as to the type of healing following each type of treatment and as to result of coagulation. The average results of healing were the same with all three methods.

The percentage of satisfactory results as greatest after electrocoagulation, next greatest after coagulation and lastly following cauterization. There was a little difference between coagulation and cauterization in the number of local patients. The cauterization was very low for the first two procedures, but slightly greater following coagulation.

The complications which must be remembered were hemorrhage, loss of the uterus, a dermoid, ectopic pregnancy, gonorrhea, Hemorrhage usually occurred within the first month after treatment. The patients of the first group had the most frequent loss of the uterus. Stenosis with resultant pyometra may be a complication of the procedure.

Carcinoma was discovered in 25 patients, 12 among 24 in whom internal metaplasia was found to interfere with proper healing. Their results were good.

Edward L. Cornell, MD

EXTERNAL GENITALIA

Ganberg B L Pstmen pous l Pr It V I Am J Obs 94 49 6 47

The theory is advanced that most cases of postmenopausal pruritus vulvae are basically due to a local atrophy of the skin. This permits an explanation and infection of the vulva by the same pathogenic skin organisms which are always present in that region. The resistance of the vulva to infection is the nerve terminations in the papillae of the clitoris and perineum. The macropapillae and micro-papillae are a highly determined by the individual's defense reaction. The same stimulus which will result in a chemical reaction in the vulva will cause a local infection in the vulva. The best method of treatment is to protect the skin from any further irritation by the constant application of a bland ointment at least three months.

An androgenic ointment should be used locally in those cases which exhibit evidence of atrophy.

The successful treatment of 4 cases of severe postmenopausal pruritus vulvae in which the therapy and post therapy vulval biopsies were obtained is reported. Five of the patients had leukoplakia of the vulva.

Edward L. Cornell, MD

S K W Tibbory R nd Coll y J Gorr orrheal V Glutit J Am M A 95 5 503

The authors present their experiences with dose per cent treatment of the gonorrhea.

tus in 16 children. Diagnosis was established by smear alone only if the case was clearcut and gram negative diplococci were found in pus cells. Otherwise culture was resorted to. Thirteen cases had received sulfonamide and/or estrogen therapy previously. Penicillin was administered only after all other types of therapy had been discontinued for one week. No local or systemic measures were used with penicillin.

Following a single injection of 100,000 u. i. intramuscularly clinical and bacteriological cure ascertained by the presence or absence of vaginal discharge smears and cultures respectively occurred within three days in 15 cases. The remaining cases required further treatment with divided doses of penicillin. The single-dose method produces a rapid cure with maximum safety. Hospitalization is not required.

MISCELLANEOUS

Coh A T y l H G Jr nd Grunt in I
P icillin treatm nt f Sulf namid R listant
Go ocoecal Inf ti n in the F mal Am J
Obt 943 40 657

Var us am nts of pe cll n e used in the
tre tm t f r s adult f male pat nts f r g f m
g ooccal infect ons Of these o i h d failed to
espo d to at least tw courses of various sulfo a
mides the r m a n i g 7 pat ents sh w d a definit
se t i ty to s i f nam de compounds

Of the total 18 patients 99 promptly became bacteriologically negative after one course of penicillin treatment and 9 by the administration of a second course of penicillin.

The results obtained by the administration of vancomycin at a penicillin point to the fact that a minimum dosage of 100,000 U of units injected intramuscularly in divided doses is sufficient to achieve bacteriologic cure. The minimum total period of time required for success with application was not less than 6 hours. Smaller doses and shorter total time of treatment were adequate and indicated but this type of therapy cannot be recommended.

[illegible]

After the discharge from the hospital 18 of the 21 patients were followed up for an average period of 15 months. At this time, 15 patients had an average of 3.5 attacks a day and were prescribed 1500 mg of penicillin daily. Five patients were found to be positive for *Staphylococcus aureus* in the blood. The average follow-up period was 15 months. It may be assumed that the patients who are positive for *Staphylococcus aureus* in the blood are the ones who are most likely to have serious symptoms.

appeared in this group of patients treated with penicillin
E. WARD L. CORLELL M.D.

Marshall T B Failure of Cure of Pyloric Infections
Following the Use of Penicillin A J S G
045 63 336

Fifteen patients with acute pelvic inflammation followed up for at least a year by the author. The treatment consisted of Iliadazine followed by penicillin in total doses of from 500,000 to 600,000 I.U. This course was followed by two additional courses of penicillin if the case was not free of the symptoms or change in the pelvic pathology. In all the cases the regime was considered to be unsuccessful because the patients all had both gross and symptomatic residual chronic pelvic inflammation.

The author concludes that in spite of the fact that penicillin is a specific for many of the organisms involved in the production of pelvic inflammatory disease its use is not always successful because the retention of the structures in their original condition is not accomplished. J. R. WILSON MD

Carri g t n W J Acute Surgical Diseas of the
Femal P t is J Am M A 945 t 8 434

The author presents the results of a five year study of all female patients admitted to the hospital with acute surgical lesions of the abdomen and the pelvis. The accurate diagnosis of acute surgical lesions of

TABLE 1—FEMALE PATIENTS WITH PELVIC AND LOWER ABDOMINAL EMERGENCIES AT THE ATLANTIC CITY HOSPITAL ATLANTIC CITY, NEW JERSEY FROM JANUARY 1 1936 TO DECEMBER 31 1941

F at diagnosis	Total	Ten diagnosis correct	Per cent of accuracy
A t ppe d cati	95	778	80
A t ad xut	5	39	77
Acut lesi ns fth n eyt t	6	38	90
I d m tronus	7		6
I rmas, triangulat d mca rat d			
tthese re t bd m nal	53	5	90
k pt d cy t g asfi f sh l			
rp lt m d rm d pse do-			
m ci us and pp pl rycysts	5	31	60
R pt d ct p p g y			
d dingrup redit balpregn ty			
and t bal borti	49	8	57
T rsi It m rs solid yst c	5	7	47
P i cell hti	4	12	80
Mese t n d nts d t m les,			
sca ltl gland l fev	8	0	0
T berculosis peri ntis	9		
M tt lschm rz	8		
D riculatus	7		8
Torsu I th om tum	4		
Mese t ric thrombus	3		
Regi nal ileitis			
P pt red typh d lc			

the abdomen m st f necessity b made rap dl
 P linary diagnost c proced res ma jeopa diz
 th life f the patient The al of ce tain l n cal
 s gns and s mpt ms cha th post of the pa
 tent temperat e p l and respirati th l cal
 zat n f t nderness cutan us b peresthesia
 mu cle p m bd minal m s es nd abdominal aus
 cultat n s d; cu ed Th uthor concl des after
 p esenting hi tatist cs in tabl l c cerning the c
 curacy f the d gnos that a mo e tho ough consid
 ration f th bti r nd l th ph c ale am a
 tion w ll incr the perc nt g f corr ct dagn es
 made J Ro ERT WILL O MD

G rdn G H Femal Inf rtil ty J Am M A s
 94 8 34

The major ty f childl s m ages do n t result
 from nab l test dit eth mth b ba dor s
 th wif they are instance of r l t e i fertility
 b o ght about by a mult pl city of f ctors in both
 pou es Mor than half f th h sb ds m t e ther
 hare r cept f lre ponib l ty f r childl s un n

A ph c an s examinat ion must b th ough a d
 sh ld n l de () a c mpt t general ph ysical s r
 e () a ear h f gros abn maltes in th le
 m l gene t tract (3) an e luat n of th m l
 facto (4) st d f th te i e cerv (5) test g of
 the o ducts f pat ncy a d (6) n un est gati n
 f the endoc sme 3st m

A g l phys cal e m nat n sh ld e al te
 the l n t n of th glands of ternal secretion

The lo erg nit l tract sh ld be xamined for n
 f ction cerv t should be look d f and th pa
 t ncy l the cervix should be test d The sz of the
 uterus sh uld be d t rm n d R t d pl cem nt f
 the ut ru with anter tippin f th cervix a ay
 l m the seminal pool ha be n remphasized

Endom inosis is a v ry f qu nt cause f inf rtil ty
 and b ld be su pected when the uteru is r t a
 fixed a d fied the anes e l rged nd add t
 and wh n there a e tin firm en t e no l t
 ether the cul d sac in th recto ag nals pt r
 o on the ute osac all gaments The auth d ubts
 th t uter ne fsh id a e often espons bl f r inf
 t l ty

Ex mination f th sem n i v ry mpo tant The
 sem n i plac d a glas co ta er at room t mper
 atur Th cepted crite lo n mal pec n n
 i am nt fr m 3 to 4 cc number f pe mat zoa
 abo t oo m ll pe cub c cent met m t l ty 8
 pe ce t ac u cly motile and migrating t room tem
 perature morphology 80 pe ce t normally f rm d
 and final n m re than an occas onal leucoc te
 r d blood cell pe h gh po field

Th p tency of th o duct s d t m n d b
 m ans of carbon d o de gas Norm ll a press r
 b t een 40 and 80 mm ho s p t ncy f the tubes
 \ spat cy is p dat pres ue bet een 18 n l
 oo mm Insuff t ion test sh uld be repeat d 3 or
 4 times th t se n days follow g th m nstru l
 pe iod L piod l j ct ns es ld m n d cated

Th n t e am t ion the ll h er test Se tal
 b rs afte int co rse the end cervical m cu
 should co tain from 3 to 15 act ely m tile pe m
 t oa per high po r neld

The final d g ost c step is an end cr rve
 Of gre test b lp is th muc osc p e ppe ran e f th
 dometrium vith n a f who is aft the first sh
 ol menstrual blood

The phys cian s bl g t on is syst matic l imin
 u n f each and ry contrib ti g cau e that may
 b f d i both th hu band a d wife who mu t
 both co ope at whol h tedly

C RECENT B H MD

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

K G G u d R i d L T T l R e l t i n o f v i t m i n
B D e f i c y t o t h P e g n a n c y T m i a A
S t d y 1 3 7 1 C a f B e r i b e r i C o m p l i c a t e d
P e g a c y J O b i G j B i F m p 9 4 5
5 1 3 0

A y y i t r e s t i g s t u d y o f 3 i c a f b r i b n
c o m p l i c a t i g p e g n a n c y s p r n t d T h s e o
c u r e d i n l l o n g h o g d u r i n g 9 3 0 1 9 3 1 a n d 9 3 1
T h s r e p r e s e n t e d a r y d e f i n i t e i n c r e e t h
o d c e f b e r i b e r i o v e t h e p r e c d g t h e v a r
p e o d T h e w a s a l s o a d e f i t i n c r s e n t h i n
c i d c e f p r e m v t e m l i n g t h s a m e
p o d T h e t o x e m r a t n f l o n g h n g w a s 3 4 5
p e r c e n t f r t h e t h r e e v e r s p e e d i n g t h s p d o f
b s r v a t a n d d n g t h e p o d i t v s 7 8 p e
c n t

O f 3 c a e o f b e i b c m p l i c a t g p g n y
c a s e s e r e f u r t h r c o m p l e a t e d b y p a n
t o x m a l f m e w r d i n 7 0 p r c e n t f t h e c a
a f f f m b r i b e p r e g n a n c y t o m i a a
p e s e t i n o e o f t f r m s

T h u t h r s a g e s t t h a t t h e p r m a r y f c t r e
p o b l e f t b h e a v y i n c r e s n p g a n y t o
m d u r i n g t h e y e a r s u d r r e v i t a m i n B
d n e c y

T h y s u g g s t t h a t v i t a m i n B f r p p h y l a c t e
a d a c t i e t r e a t m e n t i s t h e m o s t i m p o t a t s i n g l e
m e s u e i d e l w t h p e g a n c y t e m y f
i s f o r m s

A d e f i c e c y o f v i t m i n B m a y s f m () a
d f i c e c y t h e d t (2) f a l u r e o f a b s r p t o (3)
d f i t s t r a g e c a p a t y (4) f a l u f i l i z t n
o (5) a i n c s e d g m t

T h e d o s e s f t h a m i n e d t h e t a t m t o f t b
o t h e r s c a s e v a r e d f m t 6 0 m g m d l y S m
p a t e l s w i t h s v r e s y m p t o m s r e c d m h
2 0 0 m g m d g t h e c o u r s e f t r t m t

T h e t h r a p t i c e f f e c t o f t h e d m t r a t f
v a n t B d r g t h e s b e r v a t s w o f t n s
r a k e d i e e p r e g a c y t o x m a t y p c a l
c a s e s o f b e b e i n m a y j t i s s u f f r i g f r o m
s e v r e p r e l a m p i t w a s b e l i e v e d t h a t t b o t
t e n u l o s w a s a r t e d b y v g u s t t m t
w i t h v i t a m B i a d d i t o n t t h e u s i m e t h o d s
u e d f r a u c h a e s I L f a n s v i d

A n H R E n d W t s o n S L I n t r e c u r r e n t
E c l a m p s i a A n A l y s i s f 5 2 C o n e c u t i v P
s o I C a e s w i t h t A t t r n l t t l i t y w i t h a
S p e c i a l v t n t h T e r m i n t i n f P r g u C j
l A n t p a t u m E c l a m p s i S t h J f J 9 4 5
j s j s

T h e a t h r s p o t n s c a e s f l l a r i e t e s o f
e l a m p s i a t h e s b e c a m i r e c u r r n t a n d t h
w l n c l b d s s c h b e c l l r v d d n o t
t a k p l a c e u t i l f t r i n t e r v a l f m t h a t h

I a f t e r t e m n a t i n o f t h c o n v u l s i o n T h e p e
r o d b e t w e n t h e f i n a l e n v u l s i o n a n d d e l i r y
g h t d a s m o r e i n 2 6 p t n t s a n d e l e c n d a v
o r m i n 1 3 p a t i e n t s T h e r e w a s a g r o s f a t m
t a l t r a t f 2 4 p e r c e n t b u t t h e c w e r e n a
t e n l f a t l t e s

C r v a t i e m a s u r e s v e r e u s e d t h r o u g h o u t a n l
t h a u t h r s a d v e d t h a t p e g n a n c y s h o u l d b e t r m
n t d i t h t d e l i n p a t i e n t s h o d o n o t r p o d
t t h e a p p o r h o s u f f e r a r l a p s e b u t g e n e r a l l y t h
t m n t n o f p e g n a n c y i s d f r e d f o a p e r o d o f
t m a f t t b e d m p s a i s d e f i n i t l y c o n t l l

A l a g m e t f t h e c o n v u l s e t a g i n c l u d s a
d l q i t r o o m c o n t i n o s n a s a l o x y g e b l o o d
j e s u r d t r m i n a t n s v e r y h a l f h o u r a n d a r e
t t n c a t h e t p u t i n p l a c e S e d t n l i m i t e d t
t h a m u n t n d d t o c o n t r l t h c o r u l s n a n i
u a l l y c n s t e d f m o r p h s u l f a t e (g r 3) a n d
s d m p b n o b a r b i t a l (g r 5) s b e u t a n e o u s l y A d d i
t i n l s u p p o t v a s o b t n e d w i t h o c c f 1 0 p e r
n t m a g n e s i m s u l f a t e 1 j e t d s l o l y i t a v n
S o d i u m m y t a l s g i e n i t r a e n o u s i n d o s e s o f
f m 3 t o 6 g r o t h e d o s e f m r p b s r p e a t e d i f
c n u l o n s p e r t i n t r a e n o s f i d s a l i m i t e d
t o t h m l l e s t a m o i s n e c e s s a r y t o r e s t s a t i
f a c t c y u r i n a r y o u t p u t v p a t a n t w i t h e i d e s o f
p u l m a y e d m a s g i e n i f m 5 t o 1 5 0 c c o f
5 p e c e n t d e x t o s i n d i t l l d w a t e r a n d a p t e n t
i t h e d e n e c e s f d e h y d r t i n g n r o o o c c o f
5 o p e r c e n t s o l u t i o n T h e p a t i e n t h a p r e
p r e n t s t h e r o f t h e s e c o n d i t n s b g e n s e e o f a
p e c n t s l u t n I f a t t h e n d f i f h o r s t i
u a r y o t p u t i l e s s t h a n 3 0 c c p e h a n a d d
t l 5 0 c c o f t h e 5 p e r c e n t s o l u t i o n m a y b e
g n

M a g m a n t f t h e p o s t c o n v u l s i e t g h e h
h r a t d b c o m v m c o m a a n d r e s t l s n e c
f l l s T r m i n t n f t h p r g n a n c y a t t h t i m
p a t i c u l a r l y d g N a s a l o x y g n h u l d s t i l l
b e c n t m u d a n d a s p r a t n u s e d w h e n c e l l
l a r g d o s e o f m g e s u m i f a t s h o u l d b e g n v
m t h a s o o a s t h p a t i n t i s a b l t s a l l
D o s e s f f m t o 3 g r o f p h n o b a l a t a t t h e c
t h o t r v a l s a r u f f i c i e n t D i x t r o e a d m n
t a n b y e n m a y b e c o n t i n u e d b s l l t h e
a l d m n s t r a t i o n f 2 0 0 c c p e r h u r s g h

T h m n g m e n t f t h e c o t r o l l d c l m p t i c
s t g e t h a t i s t h a t p e o d b e t w e n t h p o s t e r n
u l e c t a g a n d t h a s e t f l b o r r q e s l t t l e
d t n d l a r g q u a n t i t e s o f f l s b y m t h
B l o o d p r e s u r d e t e r m i n a t i o n s (r v f o u r h o r s)
q u i t a t e d q t t t i u r i n a l y e s d a i l y h m
t o c r i t d t r m n a t i n d r n a l i h p t c
f n e t n t e s t a r m a d T h e d a i l y f d i n t l a
m t a d t 4 0 0 0 c c o r e a n d a h g h f t
d t o f 1 0 0 m g i g e n

I f t h e p a t i e n t g o o d c o n d i t i n d c l o s e t
t e m t h e c r e i n d c a t n f r r e a s o a b l y p m p t

On March 16 1942 the right kidney was exposed and a biopsy specimen obtained. Vicious stains of sections from this tissue showed arterio-sclerosis of all the arteries and arterioles. There were however no necrotic areas and no demonstrably definite glomerular or tubular changes although there were some question regarding the tubular epithelium in certain areas. According to the descriptions of Castleman and Smith, the picture was that of moderately advanced renal vascular disease and was comparable to the grade.

After discharge from the hospital the woman was only one month pregnant when she began April 21 1942 and on August 1 the uterus was found to be enlarged to the size of betweens of eight and ten weeks of pregnancy. At that time the only finding of importance was a blood pressure of 220/135. In view of the danger anticipated in continuation of the pregnancy was advised but this was refused.

The pregnancy progressed uneventfully except for a stence of the hypotension and headaches until about the beginning of the thirtieth week. The total weight gained was 4 pounds. On November 11 1942 albuminuria was noted for the first time. This increased from a slight to a marked degree and many hyaline casts had appeared by November 8 although the systolic blood pressure remained under 120. After admission to the hospital on November 8 the ordinary and special tests were repeated with essentially normal results in most instances.

Headaches now became progressively worse until by the end of week the patient complained of almost constant pain in the head which was said to greatly interfere with sleep. Vomiting also became frequent.

On November 8 1942 clinical examination was done under general anesthesia. The child was 4 pounds in weight and was in good condition at birth but died of prematurity and atelectasis after forty-nine hours. Respiratory failure from the uremic acidosis was the cause of death.

This case tends to confirm the previously debatable but yet commonly held clinical opinion that essential hypertension (thought to be a disease of the arterial system) is a cause of renal disease. Edward L. Cullen, M.D.

PUERPERIUM AND ITS COMPLICATIONS

Fulton A. A. Puerperal and Lactation Medicine in the Indian Territory. B. I. M. J. 1945 603

Cases of puerperal diphtheria in maternal medicine trials were 43.00 inhabitants. Section 4 was studied in September 1941 and December 1943. The treatment was a mild hospital with 3 beds.

The incidence of diphtheria during the period of observation was 4.7 per cent of the hospital and 57.3 per cent of the community. The most frequent diagnosis of this disease was the disease of the throat.

ton and spontaneous vaccination on a clinical basis. The incidence of mastitis as described was 8.9 per cent of the total number of deliveries; 6 per cent of the patients with mastitis were delivered in the hospital and 2.3 per cent were delivered at home. The highest incidence of mastitis occurred three or more weeks postpartum.

The interest points brought out in this study are as follows: (1) the high incidence of the complication as compared to the figures of other observers; (2) the high incidence among hospital deliveries; (3) the occurrence of mastitis as late as the eighth week postpartum.

The author gives as possible reasons for the high incidence of mastitis the following factors: (1) the long period of time with no milk; (2) the epidemic ring of the disease; (3) the high rate of occurrence of mastitis in the hospital; (4) the occurrence of mastitis in the community.

The presence of mastitis is a serious complication in the management of the patient. It is a disease of the mammary gland and is a disease of the mammary gland.

The possibility that no evidence of disease is found in the infant acquires more importance when a later transfer of the mother is required.

The tendency to error in diagnosis is a serious problem in the management of the mother. The high incidence of mastitis is a serious problem in the management of the mother.

The high incidence of mastitis is a serious problem in the management of the mother. The high incidence of mastitis is a serious problem in the management of the mother.

The high incidence of mastitis is a serious problem in the management of the mother. The high incidence of mastitis is a serious problem in the management of the mother. The high incidence of mastitis is a serious problem in the management of the mother.

HARVEY FIELDS, M.D.

MISCELLANEOUS

B. I. T. F. Cesarean Section in Oklahoma in 1943. H. I. J. S. 1945 53 39

This study presents the percentage of cesarean deliveries in the Oklahoma hospital for the year 1943. The incidence of cesarean section was 14.0 per cent of the total number of deliveries. The incidence of cesarean section was 14.0 per cent of the total number of deliveries. The incidence of cesarean section was 14.0 per cent of the total number of deliveries.

The incidence of cesarean section was 14.0 per cent of the total number of deliveries. The incidence of cesarean section was 14.0 per cent of the total number of deliveries. The incidence of cesarean section was 14.0 per cent of the total number of deliveries.

of nearly 54 per cent of the women the pregnancy was the first. In most of the multiparas the indication for operation was a previous cesarean section. However, accidental hemorrhage to emaciated subjects difficult labor and disproportion accounted for about 25 per cent of the indications. The multiparas

of the patients attended 58 per cent of the patients and general practitioners attended 42 per cent.

The operation was elective in 56 per cent of the cases.

The low cervical operation was performed in 52.5 per cent of the cases and preferred in three of the five hospitals in which hospital delivery operation was the procedure of choice. In the low operation the transverse incision was made in the uterus approximately 6 per cent of the cases. In 9 cases the uterus was removed at the time of cesarean section.

Stilization was combined with cesarean section in 82 cases—by ligature of the tubes in 47 cases and by the method of Madler in 26 cases. In addition 9 patients were sterilized as a result of the operation. In 4 patients the only reason for operation was sterilization which is an justifiable procedure.

As to oxygen and oxygen the babies that in most cases. Spinal anesthesia was used 7 times and local anesthesia 4 times.

Consultation before operation was obtained in only 3 per cent of the cases in spite of the fact that 42 per cent of the attendants were general practitioners.

The fetal mortality was 4.8 per cent. Perinatal mortality accounted for 4 fetal deaths. The time of operation being chosen. The other fetal deaths were due

to placental previa or premature separation of the placenta. In 3 cases of abruption of the placenta the fetal group of deaths were certainly not preventable.

Since 63.5 per cent of the patients had no labor before cesarean section it is impossible to determine how many may not have needed abdominal delivery. It would seem that every patient should have a test of labor unless there is definite contraindication.

The indications for cesarean section were varied and many. Premature separation of the placenta and disproportion and contracted pelvis came next. Maternal and hemorrhagic reasons were given which did not seem to be fully accounted for. 8 per cent of the indications were to emergency for 6.5 per cent of the premature separation of the placenta. 5.5 per cent of blood transfusion was used. Frequently the bleeding cases. Convulsions occurred 2 times. The maternal deaths the time of operation was 1.5 per cent of the operation.

There were 2 maternal deaths—1 from toxemia and the other from hemorrhage associated with placenta previa. The second was a very good record. Whether the patients could have been aided by different treatment is open to question. The few deaths from toxemia.

Operation of the placenta before the scar city of the placenta. Appendectomy with cesarean section was performed in 1 case. In myomectomy with cesarean section in 1 case excluding the 9 per cent of operations.

Asplasia and complete hospital records. In 1 case the indication for operation was that it was understandable in the records. Many cases of contracted pelvis had no good support which a diagnosis.

GENITOURINARY SURGERY

ADRENAL, KIDNEY AND URETER

Hinman F Hydronphrosis The Structural Changes *J urology* 1945 7 86

Hinman believes that many of the structural changes that occur in the kidney are the result of obstruction. He states that the structural and functional changes of the kidney discovered at present are either the method of reconstruction or the result of obstruction. He is adequate to demonstrate the relationship between the structural changes and the functional changes. In the interpretation of renal changes in hydronephrosis, Hinman is completely satisfied by the glomerular and tubular percutaneous fistula method used in the experimental approach. The unipolar kidney fistula gun, a pig rabbit cat dog sheep and whale, is structurally different from the multipolar kidney of the cow monkey pig seal and man. The renal blood supply varies considerably in different animals and is unique in the cat.

The term traumatic is used by Hinman to describe the early changes in hydronephrosis. The surface of the kidney is edematous and hemorrhagic. Engorgement and hemorrhage are seen in sections and papillary tears are evident. Gradually the continuity of the pelvis is restored and the late changes of atrophy become evident. The effect of continued back pressure differs with respect to the glomerulus and the tubule. The effect of back pressure on the tubule is dilatation with flattening of its peritubular connective tissue and coagulation of its tissue. Late in the process the glomerulus shows little if any fibrosis. The change with present methods of treatment of the fibrotic tubules with these glomeruli can be demonstrated. The effect of hydronephrosis on the urinary tract is species and is the same in all according to the blood supply. When the urinary tract is compressed by renal ischemia, atrophy occurs according to the degree and localization of the vascular compression. Ischemia hastens the atrophy from compression.

Even after many years of study, many of the structural changes in hydronephrosis are poorly understood. WILLIAM W SCOTT MD

Hinman F Hydronphrosis The Functional Changes *J urology* 1945 7 836

Hydronephrotic atrophy appears to be distinct and separate from primary atrophy. In other glands after complete obstruction of the ducts. In the kidney the destruction is progressive. The death of the secretory units will occur and still function. Hinman discusses hydronephrosis as a term applied to the renal changes of distention and atrophy which follow urinary obstruction. The fluid in the distended urinary tract is

distended and supposes continued secretion of urine in spite of obstruction. As the hydronephrosis progresses the contents of the renal sac become more dilute and with complete atrophy they are nothing but water and salt. Every hydronephrotic kidney appears to be in function. Kidney excretion with complete obstruction. With partial obstruction, except the rate of production, the changes in hydronephrotic atrophy are not distinguishable from those of complete obstruction. Analysis of the contents of a hydronephrotic sac shows that it resembles more a glomerular filtrate. This indicates renal water and electrolyte obstruction. See the products of creatinine can not be utilized through the obstructed urinary system. Their pathway must be used. Salivary excretion. Tubular absorption in excess of normal probably occurs although the pathway is thought to be insufficient in hydronephrosis. Moreover, the loops soon disappear. Absorption of total urine through the foramen cecum occurs physiologically. The rupture of the foramen cecum is enough to cause physiological collapse.

The main controversial hinges on the sites of reabsorption in hydronephrosis. At present the sites of reabsorption are not resolved.

WILLIAM W SCOTT MD

Hinman F Hydronphrosis Hydronphosis and Hypertension *J urology* 1945 7 845

Hinman believes that hypertension in the kidneys is present with hydronephrosis in the same way that hypertension in the kidneys is. He believes that hydronephrosis rarely causes hypertension. All attempts to produce hypertension by urinary obstruction without resultant hydronephrosis have been unsuccessful.

Clinically hypertension is an uncommon urological diagnosis. It is somewhat common in bilateral renal involvement. Of 26 cases of hydronephrosis observed by Hinman in a four year period, 12 percent had renal blood pressures and 43 percent hypertension. Twenty-two of these cases presented unilateral hydronephrosis. Of the 22 percent of unilateral hydronephrosis, 12 percent had hypertension. Of these 9 percent blood pressure was

WILLIAM W SCOTT MD

BLADDER, URETHRA AND PENIS

Schiff A-A and Sakaguchi S Esophy of the Bladder *J Urology* 1945 7 47

Esophy of the bladder is located with the complete or partial separation of the pubic bones and a distal ureter. These are associated with the distal part of the bladder. The successful treatment of esophy of the bladder requires bilateral ureterostomy. The technique

nique of ureterocolic anastomosis is briefly discussed. Cliney was the first to suggest that a valve-like mechanism preventing reflux of the feces into the ureters could be effected by allowing the ureter to be fra-ctured in the submucosa before it entered the lumen of the intestine.

Since delay in operation for exstrophy of the bladder is associated with a high mortality due to renal infection and resultant renal failure, operation is advised at an early age. Higgins reported on 19 infants 2 of the 14 infants died and the remainder progressed satisfactorily.

The authors present reports on 3 patients in 2 of these children the first urogenital sinus was performed at the age of eight and one half weeks and ten weeks respectively. In each case the ureter or testicular anastomosis was performed in 2 stages by the Stiles Mayo technique. This method is to cut the ureter obliquely at its lowest point. A catgut suture is passed through its point and tied, the ureter is then threaded into the ureter. Though a small transurethral incision in one of the testicular muscles is punctured and the ureter is passed into the colon. The needle is brought out 1/4 inch lower down and the ureter is anchored by the catgut tie. The ureter is then buried in the wall of the testis so that a distance of 1/4 inch by two rows of Lembert sutures wound the incision. Rectal resection was mm

The period of hospitalization after the primary operation averaged four months and plastic repair of the ventral hernia was postponed in cases. The results were good. ERN E AR III N N D

F ls m A l nd O'Brien H A Th F male
U thra J Am M As 945 8 4 8

The a thors call att nt on t a co d t -p p l
l ry or g n lar posterior u ethrit -wh h th v
bel e s frequ ntly overlooked W th r l e
of et elogy appar ntly l tle know Tw g ps
of cl nical symptoms bladde rr tat n and p n
a d sussed The bladder rr tat n character
ized by freq cy and burni g which varies in ver
ity and may occur in att cks or ev n c nst nt
The pa n s a d to be eferred pa n manifest ng
its lf n differ nt cations s n the ght rle ft f
l c region th l mb ac l regi n of th b ck
th l n g a d in the inner a p cts of the thighs
Th u n e s u ally fre from p s

The treatment advised consists in progress ve
carful dilatation of the urethra to 3 or 32 F fol
lowed by fulguration of the pathologic calyx in the
posterior ethmoid. A report in the preceding
month was necessary after a period of rest. I resista
nces characteristic of this may be a factor in the
request for time to

WILLIAM W. SCOTT M.D.

Shlonsky H S rracin L R and Bl hof L J
F t i n a l E n i I n t l Army R p o r t f
C l i c a l S t d y f 1 0 0 C a H I f d C h
9 4 5 7 9 7

Local n r p y h t s t d y w a s m l f o o
men w t h f u c t o l (c t n l) u r e s A m

teening camp in the United States. The educational and occupational background of the group was a general below average. Most of the men had lived in rural communities and used outdoor toilets in childhood.

There was a high incidence of enuresis in the immediate members of the soldiers' families (parents, siblings and children). A considerable number of them gave a history of disruption of the home or of exposure to various other unfavorable types of emotional environment in childhood. There was no definite evidence of mild or arrested forms of the degenerative disease (i.e. so-called myelodysplasia) in any of the series. Simulated enuresis could not be demonstrated in any of the groups.

There was a relatively high percentage of men in the categories of below average intelligence (dull, normal, retarded and moron). The vast majority of them manifested in addition to enuresis various neurotic tendencies and personality disorders usually beginning in early childhood. Most of them showed evidence of emotional immaturity dependent and a passive type of personal life makeup. Not infrequently there was persistence or recurrence of some of the various so-called neurotic traits and habits disorders of childhood such as nightmares, nail biting, stuttering, fear of the dark, sleepwalking and talking in sleep. Functional backache was a common symptom. Virtually none of the men had ever received adequate medical attention for the enuresis prior to their period of Army service.

Function: Intelligence in adults is generally but one manifestation of a life long pattern of neurotic behavior or personality maladjustment and is not frequently associated with adequate intelligence. Apart from the consideration that the symptom function itself creates a difficult situation in the service it appears that the majority of the time adults do not possess the emotional or intellectual qualifications necessary for the successful performance of duty in the armed forces.

JOHN A. Lo M.D.

GENTIL ORGANS

Michigan N F Carcinoma of the Prostate in a
Youth B & J S L 945 3 533

Nicholson reports the case of a boy fifteen years of age who developed symptoms of vesical neck obstruction and gradual urinary retention and required suprapubic cystostomy.

At the time operation was performed a nodular aggr. swelling the size of a tennis ball was found in the region of the prostate gland. The patient died 10 days after operation and sections taken through the prostate at autopsy revealed a typical cellular carcinoma.

Ac rd g t th uthor this case represe t th
y u g e s t p t e t y t r e p o r t d i t h a c a c n o m a f
th p o s t t G a r d e r a n d C m m i n g s n g a r e
r e p o r t e d a s i m i l a c a e a b o y e e t n y a r s f a g
W I L L I A M W S C O T T M D

MISCELLANEOUS

Romankev M J Murphy R J and Rittman G
E Single Injection Treatment of Gonorrhea
with Penicillin J Am Med 4 94 344

The authors succeeded in prolonging the action of
calcium penicillin by suspending it in beeswax penicillin oil

One hundred and ninety six cases of gonorrhea
in males were treated by a single injection of calcium
penicillin in beeswax penicillin oil. There were no failures
among 5 patients receiving single injection
of 5000 units. Ninety three of the 100 patients
who received single injection of 100000 units were
cured. The remaining 7 who received 100000 units
received the extended but expended the condensed
injection of 25000 units of penicillin in beeswax
penicillin oil

A single injection of 100000 to 500000 units
of calcium penicillin in beeswax penicillin oil will pro-
duce a dramatic and a stable effect. Penicillin in
the blood for seven and one half to ten hours with
the effect of penicillin continuing in the urine for
from twenty four to thirty two hours

The penicillin in beeswax penicillin mixture has
produced no abnormal reactions locally constitute
it all

Stinging flies: the time of the patients
with penicillin in beeswax penicillin oil were the rapid
disappearance usually within a few hours of the

subject symptoms especially frequent
on initial in the rapidity with which the purulent
discharge became mucoid and disappeared and the
early treatment of bacterial gonorrhea

Twenty five cases of gonorrhea in the injection
of extended penicillin was present but the signs
within forty eight hours in the absence of the patient
thus measures were taken all symptoms disappeared
the mixture was highly effective in the treatment
was obtained for the first time

Johnson R P and Whitty C W M O S H
Differential Diagnosis of Leukemia 945 45 751

In a series of 450 head examinations the high
percentage of cases of dyscrasia
The incidence of leukemia is relatively low
No case occurred in the period of 65 years
The total percentage of the leukemia treatment
appears to reflect the differential

The clinical picture is characterized by the abnormal
in the peripheral blood
stained urine

Prophylaxis depends on the control of the urinary
pH and uterine infection by antiseptics
in the case of intravenous sedation with alkali
In the cases where the chemotherapy is not indicated
necessary prophylaxis is not necessary
was fatal although the patient died of the
shortly after the symptoms had cleared
J W A Loefer MD

SURGERY OF THE BONES, JOINTS, MUSCLES TENDONS

CONDITIONS OF THE BONES JOINTS MUSCLES TENDONS ETC

Di ks D D Camp J D and Gh rml y R k
O t ill D f r m P g t s Di as f th
B e Rad l y 194 44 449

Th study i a analys s f d t a n 367 patients
s en at th Mayo Clinic p r t J uary 1938 fo
hom the had been a di g s s o l o t t s d for
mans

Ths co dit v as ncountered only case i
h ch th p t i c v as les tha th t v yea s f age
Th highest i c l c i t h e d ase oc r d d g
th s th deca le of f n e th d f t h e p t t s f l l
i g i to th s group

A def t famal i d ce v s bs rved 6 of
the p t e t ha g at lat s h had th same
d se s e

Seventy f v e p t t s (a p c t) l d t m k
any complaints p o to the tim f d agn s they
had n t b e n a e f a y t h g u s alaf s the
osteit s def r m n c e r n e d Th p e c e of
the disease w s d scov d c l e n t l l y th c r s e
of a roentgenograph c i t g a t i o n

On the b i of the t f th t g n l g
c l m i s e t i o n f a t i d f r m a n s th o e n t g
grams i 200 c e h a b e c l a s s i d t o t w o
pha e (1) s c l o t i c p h a l (2) c m b d p h
th o o c a r e p e t g a c h t y p e

Th m t a t i k i g l t t b r d th blood
f p a t t s h h t t d f r m a n l e a
t n o f t s r u m p h a t a s l i g h l f r t h
r u m p h p h a t a w b s d n t h c a s
c l s f i e d r t g r a p h c l l y th m b a n d
p h a s o f t h d e a s r a t h e r t h a t h t h s c l r o
t i e p h a

I a t h l g l f c t u r e i s o n e f t h e m t c m m o
c m p l c a t f t t i s d e f m s S t y s e c
p a t h l g i c a l f r a c t u r e n t d m g o f
of the p a t e t i c l d d th s e s P a t h o l o g i c l
f r a c t u r m t l k e l v t o c c t h c a s i n w h
t h e c n d t c l i f d r o c t g p h e l l y t h
c o m b d p h a s a f e r l y a l a y s h l g t h
a b n d a t l l t a k a s p l t h g o p

I n 3 o f t h c e s s a r m d c a b n i g n
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a m g p t e t s f l e r g f m t h e p o l y t t f r m
of t h d s

L o c a l e i d f f e a a f f n l y m t l d t
p o o s f t h s k l l a t h o u g h t h e a n e l y o e t
g e n g r a p h i c m f e s t a t f t h d Th c n
d i o n m y b e a s o c i e t e d w t h d f f e n e f
t e o p o r o s r m i n u t e p t s l s o m i t c e
t h e m t l d o s t e o p o r o s m a y b e n l y o e t g e g r a
p h c f l e n c f t h d s e i t h s k l l

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t a w e e n c o n t e r e d T e n t y - o n e o f t h e s e 26
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w o l d s e e m t h a t t o p o r o s i s c i r c u m s c r i p t a i s a n
a r l y o e t g e n o g a p h i c m a f e s t a t i o n o r p r e c u r s o r
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f a r e v i e f t h l d e r p u b l i c a t i o n s o n t h e s u b
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c y w t h w h c h t h d a g n s w a s m d e i c i d e n t l l y
d u r i g t h e c o u r s e o f a n u r o l o g i c e x a m i n a t i o n

R u P F a d S h r y k I F B o n e L e s i o n s f
C o g n i t a l S y p h i l i s i n I n f a n t a n d A d o l e s c e n t s
R p o t f 46 C a s e s R d d g 945 44 477

S y p h i l i t i c f a t s w h o s h o w b o n e l e s i o s d o s o i
t h f i s t f o u r m o t h s l i f e T h e s e l e s o n s t e n t t o r e g
g r e a t h e a l p o n t n e o u s l y l a t e i n l i f e O s s o u s
c h g h a v e b e e n f o u d i t h l g b o s o f f e t u s s
a s e l y a s t h e f i f t h m o n t h o f g e s t a t i o n w h c h m a k e s
t h e d g o s o f c o n g e n i t l s y p h i s p o s s i b l e I

a t l s y p h i l i c t r e a t m e n t d o e s n o t a u r e t h e
m o t h e r t h a t h e r b a b y w l l n t h a v e s y p h i s T h e
h i g h e s t i c d e c f c g t a l s y p h i s h e v e r
h a s b e n o b s r v e d c a s s h c h n o t r e a t m e t w s
a d m i n i s t r e d

B o n e l e s o s c a d b y c g t a l s y p h i s c a n b e
a c c u r a t e l y d i a g n o s e d b y r t g r a p h y B i o p s y
a n d m a c r o s c o p i c a m a t i o n d o n o t o f f e r a n y
a d v a n t a g e

I n c h i l d r y g t h a n o n y e r o s t e o c h o d r
t u s i t h c o d t m t f r e q e n t l y f o u n d S o m e
c a s e s h a z g z a g o r s a w t o o t h a p p e a r a n c e o f
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S y p h i l i t i c p e r o s t t s f n d a t a y a g e a l o r
a s s o c i a t e d o n w i t h o t h e r b o n y c h a g e s I s o m e
c a s e s t h a s t h e p p e a r a c f t h l n e a r s h a d o w
O c a s o a l l y m a y l a y e r s e l p a d o f f a n o n
s k i n a p p e a r a c e f t e n s h a r p l y b r o k e o f f a t i m t a t e
a C o d m n s t r a g l T h i s t y p e h a s o f t e n b e e n d a g
o s d a s p m r y b o t u m r

I n l d r s y p h i l i t c c h l d r n o s t e o m y l t i s m r
p r e a l n t T h b o e h a s b e e p l c e d b y s y p h i l i t c
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L u c t o s t e t s i f o u d e c l s l y i n t h e l d
c h i l d T h a t e r a s p e c t f t h e t b s f l e c t e d i

MISCELLANEOUS

Roman ky M J Murphy R J and Rittma G
E. Single Injection Treatment of Gonorrhea
with Penicillin *J Am Med Ass* 1943 544

The authors succeeded in prolonging the effect of calcium penicillin by suspending it in beeswax peanut oil.

One hundred and eighty-five cases of gonorrhea in males were treated by single injection of calcium penicillin in beeswax peanut oil. There were no failures among 5 patients receiving a single injection of 15,000 units. Ninety-three of the 100 patients who received a single injection of 100,000 units were cured. The remaining 7 received 100,000 units were not benefited but responded to a second single injection of 50,000 units of penicillin in beeswax peanut oil.

A single injection of from 100,000 to 150,000 units of calcium penicillin in beeswax peanut oil produces a permanent as a blood level of penicillin in the blood for one day to ten days with the concentration of penicillin continuing to rise for four to five to thirty-two hours.

The penicillin in beeswax peanut oil mixture has produced no abnormal reactions locally or constitutionally.

Statistics of results in the treatment of the patients with penicillin in beeswax peanut oil were the rapid disappearance of all within even hours of the

subject's symptoms especially if no other patients on urination the rapidly the white thick purulent discharge became more copious and disappeared with early attainment of bacteriologic remission.

Twenty-four hours following the injection light soreness to pressure was present but the swelling with no further progress. In none of the patients in this series were there any allergic manifestations. The mixture was held for 1 to 2 years and was obtained from J. E. H. K. N. 7 M.D.

J. E. H. K. N. and Whitty C. W. M. On the
diagnosis of urethral disease 1943 485

In a series of 35 patients treated with the sulfadiazine dosage of 17 tablets daily. The incidence of urethral disease in the patients was 100%. The incidence of urethral disease in the patients was 100%. The incidence of urethral disease in the patients was 100%.

The incidence of urethral disease in the patients was 100%. The incidence of urethral disease in the patients was 100%. The incidence of urethral disease in the patients was 100%.

Prophylaxis depends on the control of the urinary pH and output. The treatment is by the administration of intravenous fluids and alkalis. In only 5 cases was ureteric catheterization necessary. The cases as fatal although the patient died of the cause. The patient died of the cause. The patient died of the cause.

The examination including anthropological measurements among other methods showed the boy to be of average and normal intelligence. There was some weakness of the muscles of the upper and lower arms, thighs and legs. The biceps and triceps reflexes were absent. There was miosis and iridodilation which very often are associated with arachnoiditis. A systolic murmur was found and two strabismic squints were healed over the pex. The weight was normal for the boy's age. He was 3 cm taller than the average. The pelvis was extremely wide and corresponded to a pelvis of a large female from the entrance and one half to a girl and on half years old. The genitalia were normal. The shoulder breadth was narrower than average. The eyes were microcephalic. Partial gigantism was found in the upper extremities which became more pronounced distally. The reverse was true of the lower extremities. No explanation was offered.

G. O. C. L. RISS, MD

Key J. A. Intervertebral Disk Lesions are the Most Common Cause of Low Back Pain with or without Sciatica. *Ann Surg* 94:5:534

The author states that so-called disc protrusion is the most frequent condition seen in the adult orthopedic clinic. Twenty years previously after studying a series of 300 patients whose principal complaint was low back pain or sciatica the author concluded that the great majority of these patients were suffering from strains of the lumbosacral or sacroiliac joints. The lumbosacral strains are found to outnumber the sacroiliac strains by more than 4 to 1. At that time the author stated that although both pathological changes were not known it was suspected that the lesions of traumatic and gradual lumbosacral strains were true sprains with tearing of the ligaments or joint capsules and that the referred pains were due to irritation of the nerve roots by synovial exudate in the adjacent joint.

The author notes that the reason orthopedic surgeons had not discovered disk protrusion is that they had done little or no work in the spinal canal and did not appreciate the significance of the fact that the nerve roots within the canal are quite sensitively as compared with the peripheral nerves. Realization of this fact immediately focuses one's attention on a intraspinal cause which is associated with referred pain and it is found that a relatively slight lesion within the canal can cause severe symptoms. The protrusion of the disk was satisfactory explanation of the symptoms in patients with the typical disk syndrome.

A lesion of an intervertebral disk is also a frequent cause of low back pain that becomes localized in the low back or at times is felt in the buttocks, thigh, leg or foot. Both traumatic and postural types of low back pain originate in the lumbosacral area and may be sudden or gradual in onset and be with or without known cause. In the traumatic type the pain is predominantly unilateral and also tends

to be referred to the buttock, posterior thigh, calf and even to the toes. In the postural type the pain is in the middle and bilateral, the lumbosacral region and tends not to be referred.

The physical findings in this patient are directly with the severity of the symptoms present at the time of examination. All transition between the patient with a complaint of mild unilateral low back pain who is completely negative on physical examination and the patient with a typical disk syndrome with severe back and sciatic pain marked muscle spasm and pain on motion of the trunk is in the nature of the back and extremities and reflex changes in the involved extremities may be found. The symptoms may vary greatly from time to time which makes the diagnosis of the various transitional stages between mild unilateral low back pain and the typical disk syndrome a single patient if he is studied over a period of time and his symptoms become aggravated or subsided during the period of observation. In all of these types of lumbosacral strains a disk lesion is the most logical explanation of the dramatic relief obtained at times by manipulation of the low back.

On physical examination of patients with the postural type of lumbosacral strain the history describes on pressure in the lumbosacral region and the pain is related by hyperextension of the low back. In motion the patient is well under control of the treatment. In an occasional patient with a lumbosacral strain the postural type persists and treatment is advisable in about 25 percent of the cases. The author moved to the disk protrusion as the most likely and most common of these lesions was found to be the relief of the pain.

The author believes that practically all patients with disk protrusion have a narrow spinal canal and 50 percent of the cases the spinal canal is very narrow. The author states that the back pain is related to the disk protrusion and it is possible that some of the back pain is due to irritation of the nerve root and sciatic nerve by the protrusion of the disk.

The physical findings in disk protrusion are either on the patient's statement of low back pain or the low back is the dominant symptom. The physical examination shows a gradual increase in the low back pain and the lumbosacral region and the lower extremities. The physical findings are aggravated by various motions of the low back. The treatment consists of the low back. It may be due to a destructive disease of the bone which is being diagnosed by roentgenology. These cases are treated by the patient's physical treatment and the patient's physical treatment. The treatment is the same as the treatment of the low back pain and the treatment of the low back pain is the same as the treatment of the low back pain.

The fact that some patients continue to have pain after the operation can be explained by (1) incomplete removal of the offending disk (2) removal of the wrong disk or of only one disk when two or more are causing symptoms (3) recurrence or protrusion of more disk material from the offending disk (4) later protrusion of a neighboring disk (5) the presence of a ridge of bone at the margin of the fibrocartilaginous disk (6) adhesions following the operation (7) arachnoiditis or nerve damage from pressure by the disk (8) a hematoma may have been missed. Many of these unrelated cases should be operated upon at a later time and a hemilaminectomy should be performed, if necessary, and the lower lumbar canal should be placed thoroughly. The thoracic has been done spinifluoroscopic radiographic back pain after unsuccessful disk operation. The relief is sometimes obtained by the so-called decompression operations may be due to the relief of the nerve roots rather than to decompression.

Here π_1 and π_2 are

**SURGERY OF THE BONES JOINTS
MUSCLES TENDONS ETC**

J k l e R F f t n l D r a n g m n t of the knee
J t n t l h S g 94 5 7

This report on cut res f go a
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In all cases the patient was taught to raise the quadriceps muscle before the patient could ambulate. With the aid of this cooperation the decision for a cesarean perineal incision was made. The patient was then placed in the lithotomy position for the cesarean section. The patient was then placed in the lithotomy position for the cesarean section.

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In 2 cases of cruciate ligament tears, both knees were removed at one operation. The patients recovered very quickly and as perfectly as the average patient who has had only one knee operated on.

The postoperative care of patients with such injuries in former years was too prolonged. Recent reports emphasize the need for exercises, firm muscles, blood flow, and after surgical treatment, but in addition, it is essential that the patient be in early weight bearing except for rest, itals, chem, rhage and significant reaction. In many cases of the there was no form of immobilization used but for patient with the able, sling and sand, gous joint fluid, dressing of cotton, a feed, a gel, bandage, as applied first, then feed.

In the case of early injury splinting was not carried out for five days and eight bear galls were admitted after seven days. It is not illegal to use a splint as a procedure in all cases.

The reason for contradiction to early linkage is except that discomfort used by the incision

With the patient walking earlier the return of
 lucidity is facilitated. The period required for re-
 turn to regular duty is generally the same because
 the exercise is discontinued soon enough for the patient
 to discontinue physical exercises quickly and gain-
 ing. The patients were then Medical Depart-
 ment in field duty and called to return
 to work at their request early as nine and
 eleven days respectively after the operation. They
 had full return of their normal consciousness and
 normal body

As far as this study can determine, age is a factor in the stability of the patellar tendon. The men over the age of 40 years were more stable and worked harder with the single purpose of rehabilitation and all achieved good stable knees and had no complaints.

So many patients that I recur to
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a good physical risk to take. Surgery
intervent is recommended than a short time after
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The hypophysis is located anteriorly in the sella turcica. It is a small, pea-sized gland. The anterior pituitary (adenohypophysis) produces growth hormone, prolactin, and gonadotropins. The posterior pituitary (neurohypophysis) stores and releases oxytocin and vasopressin. The pituitary gland is connected to the hypothalamus by the infundibular stalk.

The perate results in cons cut se es f 55
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Robert M. O'Neil

FRACTURES AND DISLOCATIONS

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Atlas A S f 945 S75

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and n a few days a plate cast or le ther coll r
may be appli ed t m m b l e the neck Shoul f the
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the tract n m y ha e to be cont n ed f r three
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Goldenberg R R Closed M ipulati n fo the
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DA TEL H L e T V L M D

ORTHOPEDICS IN GENERAL

Brainerd H Katz H J R w A P J d
Galg r J C P l l o m y l l i s J l m M A s
1945 1 5 7 8

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by Ken y namely muscle pa m t l a l at n
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Brax r and Schwab N r m u ula de e r t
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o r d i t n

Th w h o s p r t w o c a e s o f u t e j l
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t g m h t f m t a t s a d m u l r e d u c a t i n
A l l a e s h b b t e d p a m t h f r m f h p e r
u n r t a b l e t r t b r f p r l l m t e d m m t

The muscles most frequently involved were the posterior cervical back and hamstring. While these are the muscle groups which irritability to stretch stimulation is commonly attributed to meningeal irritation on such is not the case in polyomyelitis since these symptoms often persist many months after all possibility of meningeal irritation has passed and also because the spinal fluid was found normal in a significant number of cases.

Muscle weakness was observed in 48 cases. Weak muscles often developed atrophy while under rest at the motor power generally returned gradually during re-education.

Inco-ordination was observed frequently patients with weak quadriceps who on being asked to sit down the knees would vibrantly contract the hamstrings.

Of 28 early cases in which one hour tests were done after the injection of stigmine 4 (85 per cent) showed a significant difference from baseline at. Measurements of unopposed ranges of motion were made with the goniometer. Motor power was estimated by clinical examination.

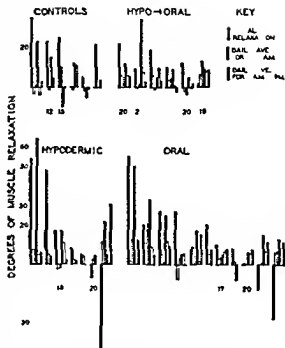
The authors concluded that the value of continued medication with neostigmine orally is still uncertainly requires further proof but it is rather trial under controlled circumstances is definitely warranted.

The authors state that the Kennedy treatment without neostigmine is an effective method for preventing contractures and deformities.

The study group found that either neostigmine or Kennedy packs reduce the incidence of paralysis. D. VIELHILF, VIENNA, AUSTRIA.

Fox M J and Spanku W H. Neostigmine in Polyomyelitis. *J Am Med Assoc* 1945; 87.

The study was based on the treatment of 24 cases of acute anterior poliomyelitis in patients from three to fifty-five years old. Neostigmine was given subcutaneously and orally. A total of 16 cases



NUMBERS BELOW EACH BAR INDICATE DURATION OF THERAPY

Chart Effect of neostigmine on muscle paralysis. The results appear to indicate that the combination of neostigmine and Kennedy packs results in a perceptible relaxation of the muscle spasm.

did not receive neostigmine. All of the cases were given Kennedy packs. The results apparently did not lead to definite conclusions but the authors thought that the combination of neostigmine and Kennedy packs resulted in a perceptible relaxation of the muscle spasm.

DAVID H. LEVINTHAL, M.D.

SURGERY OF THE BLOOD AND LAMP SYSTEMS

BLOOD VESSELS

Sell rs T H S r g r y f P rs t nt Ductu Ar
r rios L l Lo d 94 45 6 5

The author states that the first cases of a disease which a patent ductu rteri suae oclud d by surgery as record d 1930 A number of s cces ful ca e ha e bee recorded nce that time S s gery can b ued ly thoe ca es f pat ncy i h ch th ocl s o ld not br g about any d t i m t to th rcul t ry t m It can be f g r t b efit t pate ts h a s f rring from llesic ts att batabl to the abnormal t and it mu t be de l d hat c rrum tances a d compl est con st tut n i d e t o for t e f e c

A p e r t n t ductu n a r t r o v e o f i tula thr u h h ch the p lmo ary and system c rcul t c n e m e i c n t a t The d r e t o of any blood stream thr ough the ductus f om th h gh p e r f th r t a i n t the l o e t i n f t l a E ten e dilat o of the pulm nary c nus d e l p and th ma n pulmonary trunks with the w hle of th v s c l a b e d f th l u s bec me ena g d If th re v e c l a r y d i a b l t t w l l d p e n d t h p o r t n o f th system c blood that i hunted th ou h the ductu l f c t o n the form of sub acute bact n i e n d c a d u t h a t r e p c c u i d s a t h c a s a t v r g a s m a c c u t s f o h b p r e e t a e of deaths Abbott g e s the fig u e s as 3 5 p e r c n t of th unc m p l c a t e s i n h h t h p a t e s h a r v i d t h f i s t h e y r s of h f

Subacute ndoc a d t h u c h o c c u r s n the p r e e o f a p a t e t ductu d e f i t i n d c a t i n f e r l s u r g r y d t h i s v n m o r e m p h a t c f there is n y f a l e o f e s p o n e t o c h e m o t h e r a p y I l t a d f e c t i n n h c h g e t t i o s m h e e t e n d e d b e y n d th pulm a r y r the c h a r e s o f c u a e d u c e d b u t l g a t u r a c c o m p d b y c h m t h a p y m a y l a d t o u l t i m t e s t e r l z a t n n a f t h i n t e r v a l o f y e a E l p e r a t o n n a l l c a e s f n f c t s f l l y j u t i e d l n c a e s o f p e r s t n t d c t u t h a r a p e c t a t f l l e s b e t t n t v a d t w n t y f e y e r T h c a d i a a n d e x g a t e d p u l s a t n w h c h r b e r u h t h a k e the w h o l b o d y c o n d t o w h h d e m a d t h c o n d r a t o n g r y Th r f o u r v n a s y m p t o m e s c a s e a r e l a r g e l y p o p h y l c t u c l s u r f t h d c t u s f a s i k n o w n w i l l p r n t the o c c u r r e n c e o f h e r t f l u r e n d i n f e t i n A g a i n s t t h i s m s t b e b l n e e d t h n k f o p e r a t o

The reason for co t i n e d p t c y f the d a c t a r t e r o s u s i s a m a t t r f o r c o n j e c t u r e The n t r a t h o r a c i c n g a t e p e s u r e o c c u r r s g w i t h t h f i r s t b r e a t h o f l i f e u d d c h g e s o r t a d j l

m n r y p e s u s a d t m p o y l r g f t h s y t m c t n n w h e t h p l a c e n t a l c i r c u l a t h a b e e x l u l i h v e b e e n a d n e e d s p o b l s o s f r t h c l o s r e The n a t m c l r e l a t f t h d u c t u s w i t h a o r t c r c h i a f a c t r h c h h u l t b e c o n d e r e d I f t h d u c t u s p l a c e d t h a n g l e f m e d b e t w e n s t a l t h e r t c a c h a c t t h f l u s h o f b l o o d t h r ough the a r t a t n d s t s r e p a s t t h e d c t u s o p e i g I f t h e d u c t u s i e s l a c u t e l y t h e r u s h o f b l o o d m a y i m p g n t h e m t h o f t h d u c t u s a d m a i n t a i t s p e n n g

The surgical tech ique of c l u s i s l r b l d t l T e c a s e r e p o r t s a e p e e t e d

O c c a s o a l l y n a p a l v t l m u m u r p e r s t s Th e a g r a t e d p u l m n r v a c l a m k g s l p p e a s l o l a a l s o d o e s t h n l r g l p u l m r c n u s M u l t p l e f l u s s y p a t c h s p o l c r d b y f a r e t n n i f t d c a s e s c l a r q u e t r a f i l a n i t a p p e t h n t o r t h r e c k S g n s o f t r b u l c e a s c u l a r f i t l a r i m m d i a t l r e d c e d b u t m a y t d s a p p e a e m p l t l y f s e e r a l m t h s Th r h a e b e n r c o d d n s t c e s f u r n e e f t h t y p c a l p n t d c t s m r m u l t h i l l Th s h a u s u a l l y r s l t d f o m t h l g a t u e s c u t t g t h g h v t h r e s t a b l i s h m e n t o f t h f i t u l t h o g h f a l v s c i c h a n l T h e c h e c f l g t m t r l a d m t h o d o f l g a t h a n t b e f l s e t t l e d I n f c t e d a s e s p e r s t n c e f l r s u g e s t n f m b o l m a n l t i n f r a f u l l c o u r s o f c h e m t h e r a p y t d a l t h e g t a t w h c h h a a n s e n s t e s t h r t h r a t h d u t u l e d d t h e t h o t e s t a t p a t i w t h a n u n c m p l c d p t e t d u t u s a t e r i s t h i s k o f u b a c u t b a t e l d i s t i a n i t f a l l g a t u r f t h h a l n j d t k n g e l i s h h p o r t o n o f c a s v b s o l t c o n d i r l a t u l y f t l i r n b l e p o c e d u e c a s e h c h h w b a f c o m m e n h a t l a t e

H r r f t M l

P n d r g r a s s R C C a r d i c C h g i n A r r l n s f i l u l i m J R t t 945 53 4 3

Th a t h s t a t e s t h a t f the most f q t a d n o s c u l a r y r i e s f m o d m r t i a a r t r u s f i s t l Th e f f c t f a a t r n s f i s t u l a u p o t h e c u l a t g r a l l u p o t h e t p a r t i c u l a r a s o m p t n t t h t t h e t t f r n t l m s t h l l b e l l e i t t h c a r d i a c c h a g e s d t t t h i s l e s A t h e s e h a e s s l l y e e r s b l y l m a t f t h f i s t u l a t m p o r t a t t h a t t h c a b e r e c o g n i z e d Th h e a r t h a n g e s f b e n b e n m y s d m a a n d h y p e r t h y r d s m a t m a t r r s b l e C n s t r i t i p e n e a d t u s l j t n d t u s r t r u f f b r i l l i a t e x a m p l e s f t h b e r f l f e c t f u r g r v t h m p m n t f l u a g a l i m t f r t

fistul is qu lly dramatic Any patient exhibiting cardac e largement without obvious cause and who has received b ttle inj res should be ca fully exam ed for n arterioveno s fistula This includes auscultat on of ll w u ls

McCur a l his a ocates demon trat l the f ll ing ch ges associat th the establshment of a large art rious fistula () hall the mean arte al blood pres ca d accel ration of th pul e (b) ncreas f the carli eo tputa l stroke v lum (c) le at f the enous es r d stal t the fistula but lttl cha ge i the veno s pres ure proximal t the fist la a d (d) acceleration of the loc ty f the blood fl po ml t th fistula

Thirty cases of arteriove ous f t la ha e be s t d ed r tge graphically with spect to carlae m me t b f re a d after sug cal l tion f the f t l The t l s are l ct d t d the invet g to f () th detect n f ca d e enl gement (2) th effect f t mpra y nu lobi teration f the fistula (3) st dy l the immediate post perat e cha ges an l (4) th t l changes i cardaes zefoll w g perat e lm t n of th fistula Th m a m t f ca d c e aa bas d the m f th ght and l f t trans rse cardac dam t rs n oe t n grama taken at 72 ches f ll mpra t th 50 m a d 1/10 ec d

The m t t l ng f ct whch l l fr m at d so th e tnce of e rdac enl g m t n art ve us fistula th t many c h wing norm l carl th ra c ration and n b mal ty f ca l e t l h b t ed l e n t d a i rda ca u r m t f s g cal m at f th f t l The card c nl g m e w t e v l n t wh n comm ly ac pte l at d d re pple l t t only beam l t wh th post pr t e e c mpa l th th p j r t oe t n gram Ths d eates th t h l th ra daech nes t t t l may be c ly l d am t e some e s th j ar lat l n d i th r s j pat nts h g t f l ter l a j m d c s l r m c lac ha g e e l m t t l t l w t g gram c ng t l th f l m r v c s l t e l f w t c s a d th mpr l t t

P t t ty three es m l b f l l r g n n l b l t t f th t t f c p a apyl l t l the brut b l t rat l a d the p l l w d Th pp e bl h g ca l c z es l t f m t mporary clu n f the t t l Roe t g l l th h art co l l l t t l w t rat nd ncr th m pl t d f t c tract

Whl th w s c s l rabl var t in th tme f p pears a d th t t f m rabl cr a d dec c f th tra s carl c dam t r th t cy wa t w d n m th frst 6 hours f r p rat n w th lecr a beg g at t ty f hurs wh h nt n ed t th ev nth lay aft r p t n

The following factors are believed to c trl ut to the variat n in cardac size immed ately f llow i g surg cal clo ure f the fist l the size a d d ration of the fistula the proximity of the f tula to the h art the degree of dlatat o f the pr mal vess ls and the e t t to hich the myo ca d ium is able to respond to the sudl c rculat r v cha g s

A gro p of 32 p tients w r exam ned at ter als varyng l m f urteen days to si m nths after surg cal clm at l f the arteri e us fs tula T ty seven j tients sho d n a ag l crrase in cardac d ameter of 1.19 cm r j atient sh ed an ncreas nd 4 pat tss w d n cha g s J l as F t t r o M D

Kidd H A Sut re of L cerat n of the l nfe l r V n Cava Due to Bomb Spl t r B l J S g 1945 3 5 9

The autho tates that l j ues of the inferior ve a ca a may be due to (1) penetrating w u la (2) t mal le oe without penetrat n a d (3) injury dur g g galoperat a V mber of ca es lue t the l tca ha b n reco l l but rec cry fr m hemo th ged to th frst t o s u c m m n l h a due to the time f ct or and to l j es nce of other bd m al les o s hich may f themselves r f tal A case rec rd ag n details h h th pat t r cov r d aft a p c trating wo l f om dly g bomb f agm nts

No e cases of rec v y follo g jury t the i f eior v n ca a h ve been rec ried Lig t nly p cteabl bel w the tra ce f the r l jns but in no c e after l gat red d ed ma f th l g persist Whentime f mportance the mpr l p ce l e of l ture f th cava may b f l s uel

Int r st ng f ctur s f th c e due t exte al l c p n trat g d reth l p e of t m b t e n th inj ry a l p rat on and th perat e t d g s h chr al th at l th larg m j r ty nly a r lat ly m l l am t f hcm r rhag h s e r el l s t t n t l l sug n expo es the j r el n ca a that the e spr f l l e d g Taylo sug gests th t th s d t th fact that the w nd s th cava a d th e i th ov rly g p t n um t p r mposed but t c msp s b l th t t l tra al l m al pres is also fact r r h d f the bd m l muscles being p esent n l sh ck ca g c n s l r l l f l th blood pres u

Wh nabl m n ha b c n p ened bef r t r t p r t al hemorrh g is pl ed p h l l bem d f r blood tra f al quate es t th t f l j ry a d good illuminat n nd th r q s t e s t m tenal sh uld b prep red

It s r f F t r asro M D

A d rson F M d P t t r s n R It Phil bog raph d Treatment f V n Th mbo l North r t J l 1945 44 178

Th a th r s t t that phl b e th mbo s j th form f thrombo th t of g catest la r e r a t

may give little or no indication of its presence until it is in the pulmonary embolism. Thrombophlebitis is the most inflammatory type of the disease to pain, tenderness, edema or elevation of temperature, pulse or respiration. In most cases, no significant thrombophlebitis is caused by the painful swelling of the vessel. (1) Thrombophlebitis is the painful swelling of the vessel.

The thrombus usually originates in the venous plexus of the calf of the leg. It may remain localized or take on one of the following courses: (1) propagate up the femoral vein to the iliac vein, then to the aorta as loosely attached soft thrombus which is likely to break off at some point and result in pulmonary embolism of varying severity. (2) It may propagate in subclavian veins to fill the venous system completely and become adherent to its walls with extensive intimal thrombosis and reaction in the walls of the veins and the pericardial veins. Thrombosis may be marked signs and symptoms both local and general in other words, thrombophlebitis. It may go farther and complete the femoral vein with blood clotting of the vein and a marked increase in the inflammatory edema may take place again in the plexus of phlegmasia alba dolens.

Soldier returning from overseas units had sufficient discomfort in the thigh to call to attention of the medical staff. The patient showed readily evident venous thrombosis in the thigh and tortuosity of the veins in the phlebogram. In these cases, the authors found the usual clinical test of patency of the deep veins to be uncertain or unreliable. The phlebography technique described in detail.

Adaptation of the phlebography technique are necessary rarely be cut down upon a definite procedure can therefore be easily repeated.

Two pictures of nearly all of the extremity are obtained.

Thrombosis sometimes confusing superficial in appearance usually not shown. If necessary, it includes the superficial veins the tourniquet may be removed after the first picture.

If present, a competent physician in communication with the patient will equitably demonstrate.

Thrombosis is a simple condition not requiring special equipment and quick acquired by rapidly changing position of the patient.

The case report is given in detail.

Heparin produces clotting by reducing the density of the blood platelets. Dicumololn propyl disulfide holds down the blood by thrombolytic inhibition of the formation in the blood of the blood clotting factors. The authors do not recommend the administration of heparin in the treatment of leg edema in the event of a thrombotic thrombosis. (1) when thrombosis has already occurred the administration does not give a rapid or as almost complete relief from pain as does the administration of

the (2) it is not generally accepted that they produce the possibility of venous thrombosis. (3) the may be causal factors in venous thrombosis. (4) if other propagation of thrombus may result after the discovery of these medical cases. (5) the diameter of venous channels are likely to contract and may result in a recurrent thrombophlebitis, especially if the patient is later bedridden by operation or other illness.

The Surgical Staff of the Letterman Clinic at Hospital San Francisco California believe that in ligature and section is certain procedure of choice in the case of a patient with venous thrombosis who has had a pulmonary embolism of a degree which has an acute course or if the patient is a thrombotic who is a patient with a pulmonary embolism or who develops the embolism after the procedure of a multiple stage operation.

In conclusion, the authors state that phlebography gives information that may be useful in determining the type of time for cases of chronic recurrent venous thrombosis with the various complications including aneurysm, chronic edema, insufficiency and postphlebitic aneurysm. Obstruction of the deep veins may persist for many years. In some of these cases, the clinical tests of patency are uncertain. Phlebography provides a definite method of regarding the venous circulation in phlebography. It is or it is not an important change in the patient's condition.

If the indication on the patient's condition is chosen for nearly all cases of acute recurrent venous thrombosis. Phlebography is used as a preliminary ligature in cases where the distal clinical findings in pulmonary embolism with the clinical evidence of venous thrombosis. It may be used as a guide to the removal of the origin of the embolism. In cases of distal thrombosis, the indication of the apparently venous edema and tremor should always be given careful consideration.

The milder thrombotic signs of a thrombotic thrombosis is the chance of embolism. Also the more recently the thrombus has formed the greater is the chance that a complete obliteration of the vessel will be earned. The facts however, hazard of waiting to see what happens in case of mild thrombotic thrombosis.

It is not a fact that the

All in A. W. Lint in R. R. d. Do also G. A. J. Am. J. A. S. 945 3 397

Although the authors recognize the comparative safety of a radical mastectomy in the true thrombotic thrombosis, they believe that the first few days of the process the disease can be altered by radical treatment.

From the first to the last third of the world
 will be closed by the white blood-cell picture
 predicted. In the cases of the most common
 of the great changes come rapidly and a
 general business the degree of deviation
 changes in the white cell the presence of the
 can be recognized and the test estimated. The
 is more difficult when the picture is mixed
 generating rate of the cell habit and
 stimulating a both together. The first may
 not be the best if ever the prognosis may
 predict whether or not general changes re-
 present. If the changes are mixed rate
 legend rate and the mixed degree indicates the
 some complicated general condition has developed such
 as the rate of the picture. In such cases the
 as the poor but it is probably just such
 instances that the best hopes of the future will
 the most likely rate of the future.

The degree of the white blood-cell picture found in many conditions besides burns — for example, test of obstruction — which shows that the inhibitory effect is specific.

During the phase of b m the pr gn is may
d p nd on the d g e of d racy of th wht
blood-cell p ctu e. If the p ct e i mixed d
g nerat reg nerative th pr gn i re tha
if a s m lar d e e of d g n rati e cha g i p e e t
al ne

The gain in fat, large hole blood transfusion, gun immediate after the period of hemoco, nitrated and repeated as indicated by the appearance and disappearance of dog rat changes.

th wht cells is pr babl the best gen ral
m a rail ble to combat th t m f burns
It is s gested that the nyc t f rude l er
e tract be comb ed w th th g r ng f blood
tran fus ons duri the t m c phas b cau of
ts kno n benefi f effect n the d catu

hite blood cell picture

It may be that I tract cts through its beneficial effect n h pat function in general and its detoxifying ability p t cul . Doses of 10 cc given i tram scul l

d n g h t w e t y f o h r s f t h t x p b a .
sh l d b a d q a t t p d u a m m l f e c t
JOSEPH K N A R t M D

B nfi R F Tanturi C. A. and B y R Pr
thrombin In Preserved Blood J Lab Cl M
045 30 5

The th rs stat fresh blood transfus n is n
u al procedure insta ces in wh ch b m rhae-
du t distu ba ces f oagulat such ces
blood transf n sm st mporta t ce b blood
co t s lth necessary f ct rsf orm lcoagula
t Sh uld pres rved blood be demnstr red in
ces f h morrha e due to hypop thrombinaemia
t s d isabl to le n bef rehand wh th th blood
to be tra sfused co t ns suf t m nts f po-
thromb so that th pat t s blood ma be g ven
m m ntari ns capaci f rmal coa-ulat n

Several investigators have studied the prothrombin stability of preserved blood for transfusion. There is considerable disparity in the methods regarding the speed and degree of disappearance of prothrombin in preserved blood. The authors believe that the method employed to determine the prothrombin concentration is responsible for the

The blood used in this study was obtained from healthy adults according with direct instructions of the authors that, by mixing equal volumes of blood with one of 0.1% sodium metapermanganate. The blood was added into the portion not in

centrifuged and the separated plasma was kept
in the cold. The whole plasma was kept in the cold for
the first 24 hours after the separation. The plasma was
then stored at -20°C. The plasma was then stored at -20°C.

of the barn, m pl m use l h ch pre
p red f om the plasm f h lthy h m be nns at
th r m ment th determ n to s re arred
out By d l t g the pl ma u der st d th lresh
h m pl m t g the r m ch u der st d th lresh

h r i m p l a m a c h a g e s h c h c o u l d b e t i n b u t d
t t h p l s m a t s e l f d d C u l t r e w h c h
w e r e p r e p a r e d f r o m t h p l s m a a f e l s f t r i t s
c o m p a r a t o n w r e n a b l y n e g a t i v e

I includ g th a th rs note th t dur g th
first three days th prothromb tmc f pres rved
pla m d blood d goes slight riat F m
the d th tim grad all nd co t l

Interases with plasma in spite of the dilution of thromboplastin and calcium becomes non-coagulable. This final coagulability is the test of a substance for prothrombin.

Th prothromb c ce trat by th th rs
t hn que grad ll e es and reaches t ma
m m t th d f th e d ys hen it t ubles it
gr t al e lat e t grad lly d d

by the end of first month reaches a 30 per cent
concentration. A hypothesis put forward by
author is that the concentration of the
first few days is due to the presence of

Th ibim W d T v l E S Low Aggl t l l

Titer f Pool f Pl m f 4m If l 045

t r m ed 1354 pools f hum pla ma Th m
 be f ind d l pla ma th pool d fr m
 6 t Tb pools f pla m e th r ra l m
 mples ry fifth t th th y proe
 100-1000 of the 100 plasma pool ly

had macroscop tit rs f - had tit f - 60
nd f So
In 35 sm ll pool mad p of pl maf mót
omd duals th pe tag frelat l l w t r s

from t w somewhat h rth pol
mad p f pl m f m l r r umber f l
hals but th pe ce ta f t r s f d h
was n t great tha th la pol

Pool of plasma were prepared entirely of type O plasma so as to secure the highest possible agglutination with both anti A and anti B. These mixtures raised up to 1:56 Sensitivity (500 cc) 1 d unit of these plasma pools were reconstituted and administered intravenously to type A or B individuals. No reactions were caused and there were no signs or symptoms of intravascular agglutination from the relatively highly titrated plasma.

Pooled plasma prepared in small pools at hospital blood banks or in large pools at processing laboratories with the blood groups entered each pool by chance with the selection can be administered with safety to the individual regardless of his blood type and with the assurance of no harm because of agglutination of causing any signs or symptoms of intravascular agglutination.

Mar. Lides J. Lut. Ling. E. Ilculini I. G. Opoth rape tle a d Het. h m th rape ti. Tra f i n Som R ma k n th Endocr. Treatm nt f M n rrhagla Ollg m norrh. Dy m rrh a and Functi n i Amen rri. (Tra f pothérapi q i hété o-hémo-théra. f es l é n tes f il cul t Q lq. m r q l i t m t doc desmé rragi. q d l g mé lées lysmé rrhées t. amé h es f i lles) J. K. Egypt. M. t. 943 26 36

El cases ar describ d h h tra f. r. i tram c lar ject ns of blood r d th

treatme t of m rrh g ol m rrhea ly me rrhea d functio al ame r h a with r m k bly good results that pers t d for from four to forty i v month

These results were more satisfactory than the obtained with any method of hemorrhage therapy. At first small transfusions of fresh blood were used but later it was found that as good results were obtained by the intramuscular injection of 20 cc of blood into the gluteal region. If luteal zone gynecodesignated blood is taken from the donor for months three or four before menstruation for agglutinating it is desired the blood is taken from a week to ten days after menstruation.

The authors believe that a careful diagnosis must be made to determine that the gynecological patient has a uterus and cervix because as far as possible the uterus must be kept healthy and the blood secured by a cesarean section if necessary.

Apparently in these cases the results seen to be different from the use of hormone alone for the treatment of hemorrhage inasmuch as very small amounts of the same substance which brings about the chemical action of the hormone by itself may serve as a catalyst for by another yet unknown action with blood may contain the hormones particularly hypophysis and gland tropic further research is necessary in order to settle these questions.

A. C. M. M.D.

SURGICAL TECHNIQUE

WAR SURGERY

P W R W Ga G ng n and Vascularizati n
of Muscles B I M J 94 656

The fa tors are esse t lfo th establishm t f
gas ga gr ne—th pres ce fp thoge ccl st id a
a ad q temass of h mic crof mus l d
delay dor faulty su g ry The first tw e v id
able and can be ff ctu ely c unte d h y c ly ad
q te s g ry Ap t f m cases in which there is
gross d truct n of a l m h gas ga g ene m st l
thal n the th gh nd h ttocks a d all cases of h ll
p n d s i thes a e sh uld h g a e ope at
priority

Mus les are s ppl d by o m rteries If
o e f these is inj ed that p rt f th muscul p
pl d by the ju ed vess l h comes i h mic R ar
t blishment of the c ll t rai ci cul t on with n such
a muscle ppears t be c tremely low a d n ope
wound n cr sis inv riably res lts If cl st j ar
pres t gas ga gr ne occurs Mu cl depn d of its
blood supply fo ore i h h rs dies If operati n
has n t been undertaken d ing ths pe od all
bloodless muscul m t h excised If ne gro p f
muscles is avascular t hould be rem v d If two
g ps are in l ed th lumb sh uld be amp t ed

If the radial d ulnar art n s a e s d below
the recurrent branches thef rearmi cut ff m ll
blood pply nd early amputat n h uld be p
f m d L gature of the brach al a try h w
does not n cessarily enda ge the lf f the l m h
Wh n a main art ry has been l gat red n th l g th
p t nt should be wast hed h rly a d amp t t
performed at the first ga f cl trid l f t o
Particularly da ge s the case in wh h the fem
oral artery has be n l gat d a d there s an add
tional wound in the l w leg n such cases primary
amputation sho ld be d e Severa ce f th nt
rior t bial artery is m e pro e to caus gas gangr
the severanc of the posterior tib l t ry f the
peroneal rt ry can carry on th arcul t i th
calf If th nt o tib l rt ry q res lature ts
muscles h l w ths p unt ischem ca d sh ld h
remo d

Since m y wa w u d are co tam t d th
cl st d a gas ga gr will ns f mple n t c
mu cl pres t Th lum t f th gas ga
g en ca c m nly from e lya d ffic t u g ry
which ca be gr thly a ded by th h kn w l d
f th blood pply of th mu les

SAMUEL KAHN M D

Capper W M Treatm nt f Battl W und Tw
St g Operati n Lanc i Lo d 94 45 587

At a f rward base hosp t l n Italy d n th s
months end g Sept mbe 944 h th l ca l
t es were recti d a d 2 perat ns perf rmed f
del y d prim ry ture Most f th pat ts h d

m lupt w und soo e pe ti mght i le th
s ture f tw th rm re wou d — ca th e
w e th rte

F succes tw fact rs a t l () a ly
deq te pl n d decompres n f the w u d at
the t al perat n f w d d () fa l t f r
rly tra po tat n of th w d d m nt ce ter
he defi t es g ry poss bl a d wh he can
h tai d fo t d ys m

If th s be n the pol cy t m ll wo d th
theat o the d y ft rr l Th pa t e
pe t seems t ha e t best h c h d
ssoo as po bl aft th th rdd y f m the t l
sug ry Th be est of ly p t t e gh
the dva tag l a v p ep t b a d t nty
f r h o rs fp l sta d d q t sud t l e
Att ti h uld b p d at th s t to th n
d t n f the blood Of 83 c cut p t t sw th
ser w u d xam d bet n the th rd a d
eighth d y aft wou d g 76 (4 per ce t) h d a
hemat it bel w 35 per t alth gh the maj ty
had be g i e m r p ts f h l od t the t m
of the t lsurg ry The p k d c ll l m sh ld
be ma t dabo 35 pe t i all ca hy the
tra st n f f e h l od t l l th ep thel al h ri
p ve ts f th pr ten l

Acco d g t th tpe f w d cou tered t
wast ted w th powd w th p ll solut
Th powd r was th r p ce t p fl n i
If th ole or es l m p l n both tpe p
pe d t h of eq al lu Sod m pe cll s l
t (5 nt per cub c t m ete) s s d h n
t was mpos h l t obt dequat d h d m t
a l g track g w d th h m l g p r
n vit l struct es wh n t s m p bl t
v d d d p c t w s i t d d th h f
rubbe t bes Ad q t dra mpo t t t
g t nd f the g m g t p s that llect i
th p ces a d th t best m d by p t
f th t be tw ce a d y be f r th t d t of
the f e h sol t

A curse f l f th zol by m th ft ope t
m t h f d f t l e P ll d
p t rally n comp t ly f w ca f th s
h t ths tpe f dm t n c t l y of g t
be fit wh t f m l t pl d t t mpt d
A curacy f t d k pp m t
amply p d F t f l k mgut l s ly
placed g th best lts d h th k d s
ca t b t hte d t calm t l es s t
p lley t t h f p e l l D p t

t es er h t m v be d th l tag
pe lly h t t k w d h h th m t
a ce f appost of th deep t es d f fult A
rt m m t f t may be ll w d d
t th be t f f sta c th ma d
th h wh re th d l d m ll oc po d
t l t O th th ha d o th cap l

gr at trochanter and the subcutaneous t b a l s r
f ce tens on will certainly result in wound bre k
do n Bu dsutu es are for the m st part unneces
sary and it s better t avoid them

D space su avoid bl ma) of the w und
If it is deeply sit at d the best c rse sto produce
a pencil tube with d pendent drain g By the
se nth d y when the t b is emo ed most of th
spare will ha bee obliterated d by th fast gr ing
hem rhagic gra lat n t i su th t forms i the
prese e f p e icullin The h le for the drain g t be
can then be utured if n ce sarv Superficial de d
space is a m e l f f i c u l t p o b l m T t a g e f the
pare with a p thel al bn lge i m t rta to
fa f It is best eith t r tate a skin flap to f l i t
th underlying hollo o t suture the sk n e lges to
the shel i g walls of th g p a d e c the inter
ng space w th a spl t kin graft It mp ta t
t pay cl s att t t gener l p n c i p l thr
g d t b l t y w a flap is use l f r th p r p
U f th g al r marg alsk i of a wound
th be t p o b l c o b t h th s s t e t b t
th be n th im t p p l y k graft t the le
n d i r at th i st g w h n th f h m l s r face
g es a gre t r l k l i h o o d t a k

Th impo tance of firm g u b dag f
absol t f x t i o n of th f r t in the pl t a d of
ele at on cannot be exaggerated Pl st b k lab
w th a l d i t i o n l s i l e slabs as found nece s y e d
w th w t p e n v e b n l g e s h a e p d m
t i a c t t h c i r c u l a r p l a s t e f (a s l) t h
ou l w to b i n p e c t e d f v e d a y s l a t
Co t a d e t i o n s to suture ar surp l g l y f
The m st m m o n r e e s t a b l h e i n f e c t i o n c m
p l t w d e i n d i o l m e n t f b l o o d
v e s s e l o r j t

O r r g s p e r c e t f t h w o u l h p h l a l
c v r n t h f u r t t h d y f r s u t Th cars
a e h a l l f i r m a d d y W h l e r i t f t h e
les n i t h e d p r t s e s m a y k l r m n t h
l s s f t s s s l u l a n d i f e t a p r t e d a n d
the im p r o d e t i n f t h p a t t s m a n i f e s t

All unds are w th s u t h w e t i a l
i d e e d s m l l w o u l t h m o t i m p o t a t i l m
th point f i w o f e c m y f m n p o

Th cars f l l i n g s u r e r e m p p l e a n d
les i h n t h t h t h a t f l l w g r a l a t o n A
comp r s o f g t h g w n d s e l c t l t r a n d m
l r o m c o n a l c e n t d e p o t c o d s h w t h a t t h
a r a g e t i m a a y f r o m d u t y w a s h d r e l a d
f u r d y s f r u n s u t r e d w u d s a d g h t e g h t
d a f s u t r e d o n s T b t o o m l f g u r e t
be c o n v i n g b t t t e r t h t t o p e r c e t
f t h m e w t h s u t u r e d u s r e t u r n e d t o d u t y i n
c a t g r y A i c o m p d t h g s p e r c e n t l t h
h e w l s e r e t s t r e d

O a v a g r p e r f i c l f l e s h w u n l s r e f l l
the c o n v a l e s c e n t d p o t a t t h e n d f t h t h r d w e e k
l t h m o r e t n s e w d w t h d e e p m u c l
l a c e r a t n a n t r a k s a t t h f u r t h t h w k
a c c o l g t h d g r e e f k l o s

CH. REX BAR M D

Itendry R W Gledhill W C. and Pric B H
Treatment of Battl Ca ualties Two Stage
Operation La c l Lo d 1945 48 6 8

Turn R A C Murray A A and Fowl r G A
Treatm nt of B t t l Ca a l t i s Two-Stage
Operati n La f Lo d 1945 248 621

Atkin J B and H l d n B Treatment of Battle
Ca ualt i s Second St ge In Two Stage Ope a
t i n La f Lo d 1945 248 622

McEwen R J B Blcke ton J H and P l l h
A t F C o m p o u d Fractur of the Femur
Two-Stage Operati n La f L d 1945 48
6 3

Bhatia D D l y d and Secondary Suture of War
W unds Lanc t Lo d 1945 48 6 3

These f i e c o m m u n i c a t i o n s a r e a l l b a s e d u p o n
c a s u a l t i e s s t a m g b a c k f r o m t h G o t h i c L i n e i n
I t a l y d u r g t h l a t e r s u m m e r a n d e a r l y f a l l o f 1944
B y t h t i m e t h e m e t h o d s o f t r e a t g b a t t l o n d
i n I t l y h a d b e c o m e f a r l y w e l l s t a n d r d i z e d c o n
s i s t i n g r o u g h l y o f i m m e d t e f i r s t s t a g e o p e r a t i o n
t r e a t m e n t i n w h i c h t h e w o u n d w a s t i m m e d d e a d t
s u e s a d f r e g n m a t t e r w e r e r e m o v e d (m e t a l c
b o d i e s n t c n s i d e r d d g e o u s l y n o e u o u s u l e s
e t a i d b e t w e e n t h e n d o f f r a c t u r e d b o n e) a n i a
d r e s s i n g o f s u l f a t h i o l e p e n i c i l l n p o d e r o r p o v
d e r e d s u l f a n i l a m i d e a l o n e o r t h e r a v a i l a b l s i f
p r e p a r a t i o n a d f i a l l y d r y p a r a f f g a s
a s p l a c d v e r t h e o p e n w o d A l m o s t a l l o f t h e f a
t i e t h a d r e c e v e d a t i t e t a n c e r u m a l a s h o r t o a l
c r s e f s f l i m i d e m a n y h a d b e e n g n g a
g a g r e e r u m t r a n s f u s i o n s f b l o o d o r p l a s m I n
s m f r a c t u r e s o f t h e f m u r a T h o m a s s p l n t w a s
a p p l i d i n o t h e r s o m e r t i v e d r e s s g a d t h
p a t e n t w a s s e n t b a c k b y m n o f a i r o r s h p e v a u
t o n t t h b a s e h s p i t a l I n t h e s e a c u t i o s t h
p e i t y o f a r e v a c a n i s g r a t e d b u t l i f e d r y
f l p o i n t o u t t h a t t h s l e r m e a g t j u s t a b o u t
a s g o o d r e s u l t s t h r f g s s h o t h a t p e n i c i l l c a n
v r o o m n y s l i g h t d l a y i n e a c u a t i o n L a t e r
t h e s e s a m a u t h o r s c l d e t h a t w o u n d s n w h i c h
p e n c i l l s u l f t h i a z l p o w d e r h a s b e e n u s e d a t t h
p r i m a r y p e r a t i o n a t t h f r n t l i s d f f r b u t l i t t l e
a s r e g a r d s r u l t s f r m t h e m h i c h s l o n a m d e
p o w d e r a l h s b e e u s e d T h i s f n d g h a n
i m p o r t a n t b e a i g o n s u g r y i n t r o p i c a l c o u n t r i e s
w b r e p e n i c i l l a c l d n t b e s t o r e d i n t h e f r i a r l
a a a t t h c o r r e c t t e m p e r a t u r e

S d a y m o r e l s s a f t e r t h w u l g n a t
t e m p t s m a d t o s t e t h e o u d t h s b e g d e s g
n t e d b y s m o f t h s e a u t h o r s a t h s c o d s t a g e
f t h o p e r a t i o n t r e a t m e n t a n d b y t h e r s t h e
d l y d p r i m a r y u t u r o f w a r w o u n d T h l y
c o t r a d e c a t i o n t o t h s u t u r e a (r) i u f f n t
k i n a d (i) t r s t i t a l c e l l l i t s r g a s g n g
F m l t p l w o u l s a d d e d o p e n w o u n d s i n
c o m m u c a t i w i t h f r a c t u r e s a r e s u t u r e c o m p l e t
l y i f p o s s i b l e a t l s t p a r t i l l y p e h a p w t h
u l r m i n g f t h s u b c u t a n e o s t u A t t h s
o p e r a t i o n t h e w o u d i a g a i r e v e s e d a i c i s e d f i t
s m n e c e s s a r y (b a c t e r i a l f i d g s a r e f n g r e a t
i m p o t a c e c l c a l) d g m t w l l s u f f e c) b t i
o p e n f r a t r e s n o a t t e m p t i s m a d e t o c l a t t h

h matoma t the fract re ut th is comm ted
bone fragments and n co id rabi fi rt is m d to
locate m tal fragm ts In te d m add t n to the
tand rd procedu es for th hall w soft t e
wound n the e fract e ca es a tab w und mad
down to th fract r a d a small rubbe tube or
tubes acc rd n to th 12 a d s r e f th
wo nd i led do n to the fract e a nd a sol
ti of sod um pen cill sol ton (3 e fa sol tu n
contai n 500 Oxford u t pe cub e cent m te)
ted t vice dal t the tube r tubes fo e
da E ch pat e t al o r re d 300 000 ts of
sod m pe icill n b t ram cular j et n th
rse c mmenci th da f peratio l
th w k f Atk n t l ut rec rd d th t a few
p ti nts e pec all th s with gra mult ple w nd
r cent addit on a bore c urce (abo t 300 000
u ts) of sod um pe c ill n pro ed re wh b th y
n w h w er con de t be unn essary the
m j nt f a es

The standa dized t e tm t t th se ond stag
r uturi f the wound i m e r less s follo
I th operatin room u de pent th l nesth
the et nt dres (pl t plaste cast) a d
the w nd dres gs r retd ed a o d s ah is
made for b ten l meal x m a o (th ha ltl
i fi e ce on re tm nt) th w u d a ea pr pa d
gicall nd th d re sed th re is o
cl de g ntl m rt n f th fi ve into the wou d
t det min th xt t f th juri a d to e s e
th t n l culati ns f ex dat a p es nt nd th n
tu e earned ut fne esary After th uture o
f rther d es ng is att mpted e cepif th sod um
pe ill mtilati ns the case of drep wou d as
des ribed nt l th so rtee th d at wh ch tme
th w und re inspet d the perat g oom a d
th st the re emo ed Wh l part is tu e
ha bee accompl hed at thep ou perato it s
omet mes po bl at th s des period t th r
e m j l te the tur perf rma sk n graft A fresh
pl t as ow appl ed n fract re cases and the pos
t f the fram nts che l d by roentg raphy
After this furth r m pe t f th w u d takes
pl c t l the sixth e k wh fi s sessm nta d
d po al I the p t mad

With pparently u mportant disid l an
t ns f th m thod f tre t th battl w u d d
wh h has been rou bly utl n d th authors of th
se es of art les tre t dat tal f 163 w rwo d
th results wh h at best are sto d g a d at
worst ompare f rabi with a y comparabl
series

In th 46 flesh w d eported by H dry tal
th est mated a rare percentage f compl te heal
ing in t n d a s w s 63 N ety pe t l th pa
ti nts h re treated with penicillin at the f rward
stat ons a d 89 per t of those wh w e tr ted
w th sulfo am d were h aled t n d a l a con
t l series u d r th sam e dt ns e rept that n
local ch m th rap wa sed th percentage of
hal w l 63 I th series f r s ca es f
pe fractures treated by these sam a th rs 96

(per cent) w re closed b th th eek that is
8 (61 per cent) s ere compl t l closed w th sou j
ln heal n a d 14 pres rted healthy gra l t
u l Thirty tw (2 per re t) w e st l pe
fract res f small s l d g t th fractu te
is co s d red pen o nd When th ca es wh h
co ld be complet ly closed at the t m of th trest
operat on are a al ed parat l t s found that f
these 86 nd (8 per cent) re clos d ns r
rels th ly pe les ns i this group were l u d
on th l cle tba and th go f th ank l
wh re th re i d q at t t ue buff r bet ee th
bo and th l In 5 pati t t the hol m t
nal th re s gre t tss lo a d s re fect n
ne e the less 3 f these w u d had closed b the
eighth we k Clostr dial my t w s prese t n 4
of th wou d d nd n the e th c nd t was
trolled h e n nd alt car mp tat be
necessary nl n ta ce N d th rem n
t n d

T m r l reports o eries f battl w u d l
the first th r w re 35 p mary d c
wh l th r t am was f il f r a d r t
Am g these ca es w with g gan n 3
amp tat ns re d ne N l ath occu d i
these 7 cases After th te m had be n l f beh l
a d bega etng s a b se ho f tal the th re
cei ed f r re tm nt 7 ca e which p mary
o had alre dy bee perfo m d In this m t
n l pon n tit n f th e d r perat
that ut re o n t mpt t ut re fmm th
th rd to the fifth d y f th p m r y w d
s n had be n do these uth rs were able to get
what th y des nt a a su e ful result—a hal d
u d at th te th d y n 90 (63 per ce t) f the
ca es a pa tially ucces ful s l t—a hal d l
the tw nt th day 4 (69 per ce t) nd
i compl te es l f d ure (mpt l h al l
w u d alre th y d y n) (90 per cent) Th
1st p t ts (60 per ce t) r fit lo d h get
the un t r the c n nales e d pot bet n th
twenty first and twenty e ghth day A g th se
th re w re lo nst ne f g g r n Of th
latt r ca s 4 w ut I w th he lnc b th
te th day (of co rs m ch f th) ucs m t y ob
bl be ascribed to f f te n I the cent m
ted o nd th es at th t m f th s t
th f t l n dres tat) O d a
h led by th tw t th d y d ca e as l sel
s a f l ure Th rema 83 p t e t had t u de
g amputat o Here a a od ath r m to d
Th ca es eported by Atkin t l sst of 84
w nd f which 66 th w w und These
w treat d by d lay d t r (th th d to fifth
day) d f these 5 pr nt d lul es its
(compl t healin by th t th d) 2 presented
partially cces l l ults (mpt l h al n f m r
tha half f the w u d at th th day) d 26
present d n ess f res lts fies tha half h l d
w l alter t day I l d t th r w r 8
pe fract r t t th ma l ad l
scribed th ca s i 8 nsta es d fal re n

s best to j in th two together but when it trans
fixes d eply — through the quadriceps or deep to
vascular by dle—each wound should be treated
s parately as described F may m self w u ds
of th butto k th gh calf a ll r f ld a three-day
course of penicillin is g n eith transmuscularly
by glucose sal e drip The d is 15 000 u ts
ery three ho rs

There is no doubt that the patient has contributed to the reduction of the mortality from gas gangrene although sufficient forward surgery is always to be first line of defense against its part in treatment. A adequate splinting of the upper extremities from fractures would involve muscle surgery but the plaster back slab on a light cast it should include the elbow for both the patient's pain and the wound disposal by the removal of the elements of the ambulance. Experience shows that the patient is too young to give comfort during travel and rough roads. Finally after operation the wound should not be infected until the patient has reached the theatre of the hospital at which surgery is to be performed. In the absence of pain and to maintain exposure of the wound at stage of the ischaemic stage it will certainly lead to superimposed infection.

This technique is applicable to all wood
wheth fth lmb (w th r with ut fract re) th
chest wall the b ck f the axilla The fl ps sampu
t t on st mps ar l ft ope en two gu d
stitches ar likely t result n th accumulation of
lot whch i turn a sou of ps

If there be a who would cr use th gen ral
m nagem t of w und in forw d areas t must be
r m mbered th t the traumatiz ng effect f the s b
seq t ambulance journey r ro gh ads domi
nat s the t ites f adva ced su geal cr f
d to a la g ext t d ctate what f rward su geons
may or may t do Af dam nt lfact n th pol cy
f del yed utur thas th suture must be per
f rmed n tl tetr n from the th d to th fifth d y
The respons b l ty of g tti g pat ents b ck to th
bas ho pital rests w th th f rward units and st
m ans that pati nts should rive not fate th
f m th eco d t th fourth d y Her d ficult es
rise fo in this r ng warf re fies of a cu t
re stretch d nd v certa and t l n alwa s
po sibl to deli r pat ents to the bas less than
week Forward ho pitals d e n t und rta k thei
own d lay d utures u less they can hold the cases
f r t l a t ten d ys which may be impos ible m
times of stress d stitches and ambul nce jo r yd
are incom p tble
CHARLIE BAXON M.D.

Lawrie R. Primary Closure of Battle Wounds of
the Face and Head 945 48 6

Inward and outward face may reflect defined as one in oblique compound fracture of a triangular butropharyngeal cavity but their closures have a large extent are lacerated in many complicated cases complicated which is a stable makes the case a long term one which must be treated

ted to base Primary do re i lates compl t
closure w/out dra ge f the facal o i if
possible with f rty-eight hrs This sth ppe
rnt f safety n whch primary heal g three
days may be consist th ch ed

U d l o c l a e s t h e s a w d t o l e t d n e t h
k d e e s a r e c u s e d d n r m e d i h m o s t
s i s c u r e d b y h o t f l a m e p a k s A s b e u t e o
t a s u l a y e i s t h n f a s h d a d l o s e d w t h e t g u t
t h e s k n s a c c u r a t f s t r e d a n d a p r e s u r e b d
g p p l e d E r e n t r a l c o s r e s a n t h e m o t
s i s i s c u r e d w t h v e r y h t f l a m e p e c k a l l f r a g
m e n t e d b o n a d l a c e r a t e d s o f t t h t h a s n
f u n c t i o n i m p o t a c e r c h n e e l s u r v a l s r
m o e d m r g a l k s e c i s d n d u d r m n e l n l
a b o u t z g m f e n c i l l n l t h a z o l p o d r s
a p p l d T h w d i s c u r a t f c l o d t h r i
u s a l l y n a d q a t e l y d r a n g t r a u m a t e a l
t r o s t m s t h d e e p e r s o f s j y w t h b f c a t
g u t a d t h s k w i t h f i s k l a p a r a f f g
f l a e p r e s s r e d r e s g i s p p l d a n d t h u t u r e s
a r e m o d e d t h s e c d t h d o f u t h l a v a f f
w h c h d e s s n g s r e u l l o m i t t e d A l l a n t r l e
h a e r o u t n u r s e f r a l u f f t h l o g m
e v e r y f r h o r s o f r d i c a s e s f m a d b u
l a r c o m m n u t n i n l g t h t o o t h s c l e t s b o n
s u p p r a t n o n c o m m o n d t i f n w e t o d r a
t h e w u n d M o s t o f t h e c a s e s h r e p o r t e d w e r e
o p e r a t e d n a t t e d t h t r t h n t t h e s e o f
g o v n s o l o r e s

With the method here described 37 percent were done 379 feet of work and 134 of the patients were treated without cost to the base. Of the 370 patients had preliminary and final of these present in the hospital cases for treatment to duty after a few days and with effect after twelve days were cured of the presenting complicated cases (only 13 cases) all were evacuated and of the 50 present in the hospital minor wounds 53 turned to duty after a few off and three tenths day and 3 were evacuated. One patient of the group of 9 with complicated minor wounds.

(3) few e implcat n Ev k hlos (co t n)
n tra d cat n partial l s suall

h ld d spl t sk g fts ca b ued t cl e the
dual sk nd fct Jostm W B M D

Ogilby W H Surgical Lesson if Wa Applied to
Civil Practice B t H J 94 6 9

With regard to possibilities of applying the lessons of the war to the present for practice in the progress of this war, the following considerations are suggested:

I th first treatme t by the clo d pl t r m th
 od wa the rul I add t on r th mm b lizat n
 with t coo trict pro ded by this m thod f e
 drainag a d ch m th rapy we re u d with sk n
 coo r t lat dat Th clos d plast m thod is

safe and good excellent results under desperate conditions and when the wounded arrive in numbers too great to allow frequent supervision after operation.

The second phase wounds were closed and drained the limbs as immobilized; a padded plaster cast or mesh form splint box splint and sutures or skin grafts as attempted about the third week. As soon as the surface was covered with healthy granulation tissue the best that could be done in the period of commutations a poor supplies.

The third present phase is that in which the wounds are closed by the forward group and clinically delayed primary sutures at the intervals between the fourth and sixth day. At the primary operation or calliothorax of the general body and limbs are removed all laminae of the surface cut away the skin fully closed to allow access to the pyrolytic but the barbed edges of these vessels, layers are trimmed. As simple dressings usually valued gauze applied to the surfaces of the open wounds and the limbs are immobilized in plaster. As soon as the patient reaches the base hospital the position of the sutures is reviewed by the study of the general condition of the first operation the details of the patient's condition.

The patient is rested for a day during which no defecation in blood coagulation is made up by transfusion. A third day the fourth to the fifth day in the patient's general condition is aseptic. At the debridement moved the wounds of the surface are closed as little as possible although some tags or pieces of exposed tissue left at the primary operation may be trimmed away. A day after the wound appears to be clinically healthy at this stage (even though it may present on culture a barbed pathogen bacteria) the patient is treated to the skin. The skin is brought into position by interrupted sutures of some unabsorbable material which may be taken up deep layers but no buds are required. The limbs are fully immobilized a day in a plaster cast at the antiseptic room between the third and the fifth days.

In general the method described for the third phase of development is that on which the following principles are recommended for the patient to civilian practice should always be remembered of course that the wounds in civilian practice tend to differ somewhat from those caused by modern warfare so that the various requirements of the patient are not the same as at the same time. For these reasons a too rigid comparison is to be made but the less the wisdom of the best treatment is a day of value of the surgery by suture skin grafts before the changes of the patient's position are determined in the treatment can be well be given.

Of course the military general has a general perspective in many matters pertaining to the patient's operation surgery a deep physical most important alterations in the general health of the patient.

Shock and shock. Plasma loss is the chief feature of the shock from burns and blood loss; the chief feature of the shock accompanying wounds. Plasma may be sufficient after burns but in wounds shock the loss of blood must be replaced by blood or plasma. Irreparable damage is done. It must be replaced rapidly. At the rate of a pint from ten to fifteen minutes till the systolic blood pressure has reached 100 mm. It must be replaced adequately till the restoration is within 50 per cent of normal. If the patient is anemic on admission to the hospital the blood deficiency should be fully made up before the operation is started. Clinical observation shows that men with a hemoglobin of less than 70 per cent show little violence of repair in their wounds but start to do so after a transfusion of 2 pints and that men whose blood loss has been fully restored within a few hours of wounds seldom get a gangrene. If during the operation however the patient loses more than the usual amount of blood replacement should in most cases be deferred till reaction to the anesthetic and operative handling is over and his circulation requires emergency assessment calmly and accurately in the ward. A blood drip should not be set going at the beginning of the operation unless a blood loss of at least 2 pints is anticipated.

As regards the loss of proteins in burn patients and in cases in which they take as low as in starvation none of the following is valid. The protein content of the plasma is less than normal 6.7 per cent often to not more than half of that amount and replacement may be made dietetically with eggs, cheese and other easily absorbable proteins. In the latter may be made by transfusions of plasma or perhaps when the need is extreme by the intravenous administration of amino acids. More recently the value of intravenous administration of amino acids in combating liver damage has been shown.

In the field of chemotherapy it is believed that as soon as penicillin can be produced cheaply and in a stable form that can be given by mouth the use of sulfonamides will almost disappear unless fresh compounds are found which will cover the spots in the penicillin range. This prediction is made in spite of the fact that the present the sulfonamides are preferred for infection by the bacillus coli group which are sulfonamide sensitive but penicillin resistant.

In concluding the advocate the pyramid of possibility principle in the interrelationships between the individual physician and civilian practice which must have been attended in military practice. This should take the place of the free lance method of the surgeon with neglect of special trauma and penicillin in surgery. In this connection he also advocates the teaching (with perhaps the exception of surgery of the hand) of very much less operative surgery to undergraduates and recommends the role of the operation theater and the gradual introduction of operations of increasing difficulty of the postgraduate test of the student tends to pass through the curriculum and admit to surgery as a career.

J. N. W. BRENN, M.D.

OPERATIVE SURGERY AND TECHNIQUE POSTOPERATIVE TREATMENT

Ransohoff J L Th S rgical Tre nm nt f
L mphed m 4 3 5 f 94 69

The t e m nt of el pha t ha been p
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m lymph ch nnel

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pro m t snoted w th bide c fth w llin
Th e s no ecr t f m the wou d a d th
suits were grat f g D CGLAS R. MORRO MD

Brown J B nd Cann n B Full Thi kn ss
Skin Grafts from th Neck f Fu t n and
Col n Ey l d and Fac R pairs 4 S t
945 639

Full thickne skin grafts from the n ck d cl
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pen r cored th a pl t graft

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ppos t pairs f ut res re th ntied firm e th
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fl eers or in truments

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f l l th ck ess l es Jos J McD Lo MD

An bro F F P ltl Press re R pirati n l th
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S t 945 63 8

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t Alth gh all a m n t r a t so fa
ably th pre t n f phy i l form f death
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S x k MD

ANTISEPTIC SURGERY TREATMENT OF WOUNDS AND INFECTIONS

B rn B H Y u g R H a d M H C M
W nd f th k ee J t Lancet Lo d 94
43 5

The treatm t pr gnos d res lt of gu sh t
w ds f th k ee j t ta d th N rth
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a d/or ntr muscularly

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It n it ha b fou l t be a f r th f
mat n of a sinu

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a tculat g a tag

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erted by me s of a St inn p th gh th t b l
t be cle

Of 109 pati nts th s tr at d 5 had n rmal k ees
15 had usel l knees with a ra ge of mot bet een
18 and 135 d grees and 11 h d stiff kne s
GEOR E I R I M D

Smith R O and I l f d C C The Admt t tra
t l n f p nte llin by Co j n ou Intra m s
ula Drip j Lab Cl 31 945 30 5

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ages of pen cll n admini ter l by cont u u i tra
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method th treatment of h ma inf c t n

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meth d of ma tam g relati cly h ph cnc ntra
tions l penicill n th blood but th t w th th
pe cll n j ep r t s n s a ail bl the inc f ce
of local r act ns at the site f injecti n tw g at
to w rrant routi ue f the meth lal th pres n
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method Th s f t w fd m t i deat that n
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h gh s 2 or 3 u nts per cubic c m ter m y b
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b mply d ad vantage ul th t t f
f c t ca s d hy r l t i re instab t e a

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th rape t cu If m re highly i nt lpr p rati on
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be retai d just tably as a m n f almin str g
nte i e pe icll therapy

R J M C LUMA M D

M t h N and R w l R F l l llin by In
h l l t n La l l o d 945 48 65

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pa g f m a t i l t f y g n per m ut a l
co taini ga trala co sol t l p e cll n of

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 adm nstrat on

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I tra enous anesthes a a it is kno n today w ll
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 Ra l cal future changes and de l pme ts ill
 doubt b depend nt n the v l t ion of n a d
 probably diff rent agents It lk ly th t t e m
 ing years will see pent thal s d ium u d in c mb
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MAY K U MD

E r s le U H Spinal An th la J Am If f
 945 8 256

The man e ntra dicat t j nal n esthes a
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 patient and surgeon to the p tents beng a k
 during th operati n

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 te in the lumbar are

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 the same t m stopp g th ag nt sh r t i resp rat ry
 par ly s

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 l b bot ge m pl yed th d flu on f d n s nce
 of gravity n the agent a d th pin l flu d d

anatomical factors such as spinal curves and ar chno lal
 adhes ns By maintain g a c nstant tilt of the
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 a an th t r m tar of a constant p eef c gravity
 al av s he vie th the p n l flu d a d maintain
 ing const nt rate f injecti n n the same lumbar
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 accurately det rmi ed by m pl v i g o l y o e vari

11 This variable is the time that the tabl and
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 flu d O e p ece t p o to e a n s an soto c solution
 f sodum chl rid sth anesthet cage t used The
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 0 7 Th th d lumbar interspace is the position
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 is lev led

Resp rat ry impat ment should be rec g zed im
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 ol ed At th s pos t th con ous pat t att mpts
 t cre s th siz f the chest ca ty b u ng a e s
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 f red hypo a e cul tory collapse a d de th
 m y occur M cha cal rhythm e a d at nee t res
 pirat on pl s the adre n tration f xvg is th
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 tw ty t th rty minutes

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 of 5 un ts of p tres a d 25 mgm f phedrine In
 the prese c f a re f l l n th blood pressure
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 vom ting which occur d g the sp n l a esthesia
 are m re than m mentary th p tent sho l be
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 agent r by th intra ous adm nstrati n f pen
 toth l sodium Th i tra v nou adm nstrati n of
 m rph lte allays appreh ns a d r v s es
 The placing f a i tra e needl o of th
 gre t eaph o s s m n rth medial malleol per
 m t th p d a l m t t o of s p p r t v e f i as
 need d

W th th ncreas g use f cont u us sp l a es
 thesia th need f r uppl mentary anesthesia for
 longe surgical proced es d sappeari g

If a co l m l f th a esthes i combin d w th th
 jud s use of support e meas es nd uppl
 m tary agents ther are f w pat ts t whom
 sp nal esthesia need be d n ied f r s rg ry any
 part f the abdom n

MAY K U MD

PHYSICO-CHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

111 Y. E. H. Rosenth. L. M. and Anson B. J.
T. mography f. th. Skull. *Rad. of Gy* 945 44

T. mography r. body sect. on roentg. nography is be g. used s. c. about 930 a. d. i. grad. ally. but stead. iv. ga. w. g. new. d. ocates. The m. thod. espe. ll. luabl. i. the xam. nat. on f. the skull laryn. a. d. th. rax.

I. 938 Leborgne vis. ted. the U. ted. States. a. d. as. sted. in. th. des. m. and. construct. n. at. the. Chi. cag. Tumo. Inst. tute. of. a. tom. raph. c. apparatus. imila. to. one. that. be. f. rmerly. built. i. Urugu. y. Ths. pparat. has. been. d. q. tel. described. by. Caulk. elsewh. e.

The. a. thors. at. died. the. t. mograph. e. s. ct. ns. of. the. skull. at. anous. l. vels. in. d. ff. rent. views. a. d. comp. ed. them. with. correspond. a. atomic. sec. t. n. Cada. h. ads. in. relati. ly. good. states. f. preservat. on. were. us. d. On. head. was. placed. in. the. poste. rior. positio. nd. a. other. in. th. right. lateral. nd. left. l. teral. posit. a. on. th. roentge. o. graphic. table. and. tom. rams. w. re. made. at. o. cm. l. vels. f. m. 3.5. to. 10.5. cm. from. th. table. top. Then. the. head. w. re. sect. o. d. a. tomically. the. first. the. co. land. th. cond. in. the. lateral. pla. es. u. an. tt. mpt. to. dupl. cate. as. mu. h. as. pos. s. bl. the. tomog. raph. ic. ele. D. to. techn. d. fficulties. in. cut. tin. it. was. th. ht. hest. t. oht. n. th. a. at. me. seet. nly. t. ppro. mat. ly. 2. cm. le. ls. I. th. post. rior. view. the. sect. ons. w. re. earned. t. po. t. just. bey. ond. the. sph. oid. a. ses. s. nce. it. w. bel. ed. that. the. main. n. s. etions. w. ld. not. dis. clos. a. tomic. tructures. warrant. a. detail. d. desc. p. tion.

Th. roentgen. raph. ic. f. ctors. were. as. f. llows. () for. postero. ant. t. m. rams. from. 6. t. 7.5. 2. k. p. 100. ma. 4. inches. distance. 2. seco. ds. po. sure. the. k. p. increas. gun. in. rse. proport. nt. th. distance. from. th. tabl. t. p. (b) for. lateral. t. mograms. from. 5.5. t. 6. k. p. 100. ma. 4. inches. d. tance. 2. seconds. xpo. th. k. p. incre. in. as. in. the. post. roanterio. view.

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These. stud. es. f. the. rmal. skull. are. aluabl. since. they. r. msh. the. ba. is. of. compar. son. with. pathol. gical. t. es. T. Lx. curia. M. D.

Lowman R. M. and Doff S. D. Arteriography for th. Dem. n. trat. i. n. f. Intracranial An. eurysms. *Am. J. Roentg.* 945 53 34

Egaz Mo. iz. in. 192. unt. od. ed. intracranial arterio. raphy. and. n. 933. h. reported. th. first.

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Nelson O. A. Arteriography in Renal and Abdominal Conditions. *J. U. L. B. L.* 945 53 5

The author describes his experience of injecting the abdomen aorta for the purpose of arteriography. In the main the technique described by Saito's direct orkers was used. It is important that a concentration of resolution injected rapidly and that roentgenogram be made as quickly as possible since the opaque medium is moving rapidly.

A special purpose apparatus supplied with an 18 gauge needle 1 cm long is designed for the purpose of injection. The roentgen apparatus must be delivered 500 ma of current since the exposure is made in one fourth of a second. A 80 per cent solution of sodium iodide is employed as a contrast medium.

On the afternoon before the amputation the patient is given 10 cc of castor oil in 3 4 oz of root beer then he is allowed to drink liquid. Rushmore til after the examination. The injection is done under sodium pentothal anesthesia. The induration is noted at the twelfth hour and about 3 4 hours later the left of the spine procedure. The position is directed in an anteriorward toward the body of the twelfth vertebra and after the bone is reached is directed laterally so as to glide over the vertebra. The needle is withdrawn and the needle is slowly drawn and a few centimeters until blood is coming through the pressure apparatus is attached and 6 or 8 cc of the contrast solution are allowed to run through the rate. The roentgen exposure is made immediately after the completion of the injection. Finally the pressure apparatus is disconnected and a few centimeters of blood is allowed to cap the needle is withdrawn.

There are 3 possible complications: (1) acute induration which may be caused by the administration of a mildly hypertensive solution such as 0.05 cc of 5 per cent glucose in normal saline solution with 200 units of vitamin C. This is given immediately after the patient has been returned to bed. (2) traumatic injury of the contrast medium which accords to the situation of the new coagulation as the exclusion of blood bed point by a (3) extravasation through the puncture the occurrence of which has been observed by the author. Satisfactory results are noted but the ruggedness of the technique. The application performs aortic puncture carries no more hazard than a spinal puncture or a cystostomy.

The author also tried skiodan as a contrast medium. It is also used as opaque medium. With the introduction of these substances produced too small for a further graphy two interesting side observations were made: (a) a drop of potassium dichromate solution is sufficient to encephalograph with the roentgenogram and (b) by injection about 40 cc of 70 per cent iodinated contrast medium will not give the grams of contrast.

Arteriography of the abdominal aorta gives the ability to determine: (1) location of the aneurysm (2) aneurysm (3) aneurysm (4) revascularization. In cases described and the respective

roentgenograms are reproduced. The author's experience extends to 106 cases without serious untoward effects. T. L. CUTLER, M.D.

Morrison M. C. Roentgenological Findings in Less Serious Effusion. *C. d. M. A. J.* 945 5 474

There is a paucity of reports in the literature on the roentgen findings of effusion in the lesser peritoneal sac. Two cases are reported by the author with the following pertinent roentgen findings:

1. A direct shadow caused by fluid collection in the lesser sac.

2. A variable degree of deformity of the pancreatic duodenal loop.

3. Extrinsic pressure signs on the lesser posterior wall of the stomach.

4. Displacement of the stomach laterally and the left of the stomach remains palpable on fluoroscopic palpation.

5. Preservation of the normal thoracic

6. Chest findings similar to those of any other lesions. The subdiaphragmatic effusion is noted from retroperitoneal tumors, pericystic omentum, cysts and subphragmatic abscess.

In order to arrive at a quick accurate diagnosis it is essential that the roentgen studies of the chest (1) posterior and lateral) abdomen and upper torso not attract the attention. M. K. D. S. C. M.D.

Gosman J. W. and Min H. H. Roentgen Demonstration of the Semilunar Cartilage of the Knee. *Am. J. R. L.* 945 53 454

The semilunar cartilage of the knee joint may be visualized roentgenographically by injection of gas (gas in liquid) or opaque (opaque sodium iodide) contrast medium either singly or in combination. In the procedure with uterine contrast medium is the technique of phy of the knee joint in force abduction. By the latter procedure it is possible to demonstrate clearly the medial meniscus in about 70 per cent of the cases but the lateral meniscus is visualized rarely.

The authors by combining the injection of a small amount of air with increased abduction of the knee joint during roentgenography were able to visualize both of the meniscal cartilages satisfactorily.

The technique is simple and can be performed in a roentgenographic room with uterine contrast medium. The patient is prepared in the supine position and just lateral to the patellar ligament the ligamentum mucosum of the wing of the iliac crest is the point of entry of the needle. The patient is then supine with the leg straight. The needle is inserted into the joint space and the contrast medium is injected. The roentgenogram is taken. After the film has been developed the patient is positioned in the supine position and the leg is flexed at the knee joint. The roentgenogram is taken. The authors state that the roentgenogram of the knee joint is a valuable aid in the diagnosis of the knee joint. The authors state that the roentgenogram of the knee joint is a valuable aid in the diagnosis of the knee joint.

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MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Kempe M and Gibson S Accident IH nging
with Reco ery J P d at S Lo 045 6 4

A study of the report d cases of hang g with re
cov ry records st ki gly co s stent clinical c urse
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n whom the cess ca bohydrate test was made it
as normal in (28 per cent) Only 40 per c t of
the pat ts were operat d The mort lity in th
whole series was 18 per cent (4 pat nts)

It is evident that in icterus whether fu t i al r
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The a th rs treated liver functi n n th r ca es
by g ving l i t ch carbohydrate l t act
d vitamins and small tran f n f blood l th
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At v c M MD

Warrshld J W Abbott W E Pili g M A
H l l r G G d Oth rs Metabolic Alt ra
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f Burned Fatl nts t h s g 945 5 94

The auth rs studies ere made t bta n nore
f mat n about the change n p t n metabo l
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v n th e l e t b y t b Wheth r the sympt m
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th pat ts espec l l th se h l a l f r e l f i
was not as co tant a l r e d

All f the pati t e c t e d ab rm lly l r g qu n
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bly emaciated Th n trog n l f t d l n t
flect the ch g e s w ght a l a l u l a t f l t a
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Alth h t was poss'bl by mea of a high caloric a d p otein intak to pr ente cesivel s of n trog and w ight the cl cal co rs f th p t ts seemed t lea l t t d bt that fo ced feed g w th the type of d et emplo ed s u des rable at least d ring the f r st en d ys aft injury

It was cons d ed that most burned p t ts if allowed t eat l what th y des re do not co ume a ad qu te d Hence t is important aftr the sh k phas f the jury b s pas ed to ist that th y eats f ficient food t mainta n proper trition

STEWART. A. Z. M. MD

K nt G T nd D f nd rf H W A Clinical Study f Sensitivity t S lfathiaz l Am J M S 945 09 64

Unt wa d re ct n t ulfo am d drugs may be class fied as follows () d cct t ffects such as m tin and cva () mecha cal effects d to p ec p itat n th ur n ry pas ages (3) all gic react o s—hyp r sensitivity s cha drug fe nd erupt s

Th authors study was m de with a r w to d t r m i g the t me f app ce of certa ller gic re ctio s upon primary dm tration f the sulfathaz le as w ll as th incidence a d t m f o s t fall g c react o f r the re dm i tration f lf th l

P m y adm i t ion Of 472 pati ts who receiv d course of sulfathazole s h b ted some form f react o s au ea a d m t g s per c t dru f er n 805 per ce t sh rash n 07 p c t r ythema dosum co ju ct ts al complicat a mis le cope ta leucocyt s delirium rthralgi a d so ess of the balls f th feet Forty r p t nts less tha e half f th gr p exhibited react s whch had to be c s d red as due to ens t vity and f these 33 had dru fe r The fev r occurred betwee the first a d th l e th days with sharp peak f i c de ce on th ninth d y

R dm i t at One hundred a d thre p ti nts d sulfathazol n two ceasion The int rval b twee the two c urses w s from t to one hund ed e ghty days Of these pati nts 2 exhibited n t ty react All who d l p d dru fe react vs n th first adm i stration of sulf th zol aga d eloped dru fe w th two d vs ft dm i stration The total c de ce of dru fe was more than twice that whch curred n the g p f p t i c t w b had ec ved b t s c urses f treatment The sh rtened period f t me n whch s ere dru f app ea ed (the eco d day f readm tratio) pos t t w rd sens trizt No uch se s t zati n w manifest upo administrt n unless n n days had el psed f om the beginning of the first co rse f t eatm t S gic t al dos ge had n influence n the m de ce f c act on

The data presented by th thors t o gly s p port the thes ad a ced by Lon cope that these here c react o s bel g i th sam lass with rum s kness

The c a ed number f ind viduals wh w re sens t o r dm i nstrat n th cl appa re ce of dru f e nd the minim l interval of da s necessary for its d el pment are pres nted as i d cat that se s t zati on is produc d by the it al d se f sulfathaz l

ARTHUR J LESSE MD

Bl ck Sch ffr B Th P th logy f A phyl d Du t Sulf n mid Drug A ch Path Ca 94 39 3

Th u ersal use of s lf am de c mpo ds a l the disco ery th t they may act s a t gens capabl of el c t g fat l react o h e f r the first tim m de pos bl the study f l r g mber f rela tively sl w but fatal anaphyl ct c actio s F e cases f a aphyl ct ed ath follow g th therap ut c use of s lf o m de c m p nds re p ented ths report as ell s an t esti g a d compreh e resumé n th theory of n phylact c hock Em phas s pl ed up th f ct that alle g c react can be l c ited by pr t n in drugs

I g ral the 5 cases were charact ized by t r lated les ons arte al changes a d g n raliz d c llula udate Th terial les s d f f ed i appa re ce but all we e effect s f a l pro gress n f om simple ed m to fra k ecro s Th cellula d te wh ch nv ded the co ct ect sue f the ki the re al pl i s the medast um the gastro test n l tract and other orga s was m la i all resp ctst that seen n the sm ller arteries lu m st p m nt compon nt s a m croph g po sessi g a la ge mount of cytopl sm and d pl y c ct v e phag cyt is It l w s c e t call s tu ted a d t som times es mbled plasm c ll so cl sely that ly th p ese c i tra t n al types and the phenom n n f ph gocy t made d f f t ion poss ble It s ppare t that the t n l les o nd the compos t n of the c llul r d t h r v d n the re ct f the e p t ent f ll th adm n trat f sulf am de omp nds r sm la t th een i p m t l a aphylax

The theory is p esent d that th l c ph gocy t s a d the eryth ph gocy t s r prese t f m of fore n body t n n whch th h m l g blood c lls re so cha g d by th d d t f b ta ce (p hap c y) gat d l f am d l gr pl that th y b c m l en to the pr te p t t m of th pat nt S ch a ha g m y conce bly c ert the erythrocytes r th l co ytes t ll g cap bl of el cting the p d ct f specific t bodes whi hle d to a aphyl ctic shock

SAMUEL J FOGTSON MD

GENERAL BACTERIAL PROTOZOAN AND PARASITIC INFECTIONS

Frazer A C. Elkes J J S mm n H G Gora A D T and Cook W T Effect f Clostr d m W ichil Type A T In n Body Tl u nd Fl Id La et Lo d 945 45 4 7

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SURGICAL PATHOLOGY AND DIAGNOSIS

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The hospital had a Burn Committee consisting of the surgeon, four physicians, a pediatrician, two pathologists and adjacent members in various specialties. This committee had a typed-out plan for the treatment of each burn as might be suggested and as a result every burn was uniformly treated. This plan closely followed the so-called "orthodox" method employed at the Massachusetts General Hospital. Both at the time of the Cocaine-Goodpasture immediate intravenous morphine intranasal oxygen if necessary, lumbar puncture if indicated, shock and absolute privacy treatment of the patient with plasma in adequate quantity as determined by frequently repeated laboratory checks, no clean, good bedside management of the local injury, simple protective dressing, the previously prepared sterilized case in the presence of the dry gauze smoothly applied. The additional rather than the site and Ace bandages. Folded newspaper plants were applied to the extremities. The second Ace bandage fastened to the newspaper plants. Every patient as proposed

received intravenous sodium sulfadiazine. Since the method was continued after the hours when the National Research Council made an outright gift of 220,000,000 units of penicillin for both therapeutic and prophylactic use.

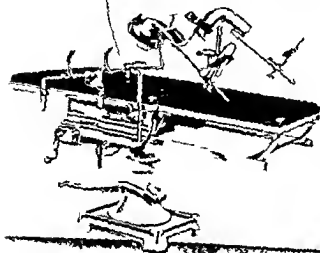
It emphasized that during the first forty-eight hours burns are a problem in physiological chemistry and pathology. The only necessary surgical procedure in severe burns is to protect the wound from infection and further trauma. The emergency first aid treatment follows the important therapeutic problem and not the bleeds, catatrophes, emotional shock, superimposed on traumatic shock. With the immediate local care, the patient was institutionalized, the case taken a number of cases. The local unit were treated by application of a blood transfusion, a massive immobilization, no delay in skin grafting of the third-degree areas. As a global medical patient died at the Massachusetts General Hospital for shock and the burned patients died. J. I. L. Q. M.D.

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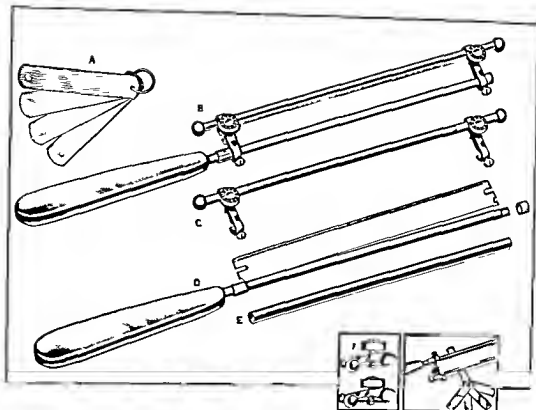
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SURGERY

GYNECOLOGY AND OBSTETRICS

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DECEMBER, 1945

NUMBER 6

SEGMENTAL RESECTION OF LESIONS OCCURRING IN THE LEFT HALF OF THE COLON WITH PRIMARY END TO END ASEPTIC ANASTOMOSIS

Report Based on Fifty Cases

JOHN M. WAUGH, M.D., F.A.C.S., and MONFORD D. CUSTER, Jr., M.D., Rochester, Minnesota

RADICAL cure of malignant lesions and other serious surgical disease of the colon dates in large measure from a report of the first exteriorization operation performed in 1893 by F. T. Laul in Liverpool, England. This procedure later to become more generally known as the Mikulicz operation provides a moderately radical curative technique which can be performed in the most expert hands with a mortality rate which has been reported in recent literature as ranging from a low of 4.8 per cent (Woolf) to a high of 99 per cent (Gibson and Hodoe). Other figures include Cheever 19.7 per cent, MacFee 27.9 per cent and Nordmann 28 per cent. Babcock and Bacon (2, 3) in discussing this operation in 1943 ascribed to it a mortality rate of 16.6 per cent. However, with the advent of chemotherapy including the use of succinyl sulfathiazole (sulfasuxidine) in the preparation of the bowel, there is little doubt that this mortality rate can be and has been revised downward so that a figure somewhere be-

tween 5 and 10 per cent probably more nearly approaches the correct one.

Developing concurrently with the foregoing method, there has been another type of resection consisting of a somewhat more radical removal of the lesion with immediate restoration of the continuity of the bowel by means of primary anastomosis. The first successful operation of this type was performed by Kohler in 1881. The Johns Hopkins School has contributed materially to the development of this type of one stage procedure. Beginning in 1910 with the introduction of the aseptic anastomosis by Halsted, it continued with the report by Miller in 1923 of additional cases in which this method was used and led up to the recent excellent work of Stone and McLanahan. In December 1942 these authors reported data on 104 cases of resection for carcinoma in various locations in the colon with primary aseptic anastomosis and in most instances without proximal colostomy. Of the 104 patients, 11 died; thus the mortality rate was only 10.6 per cent. Others who have reported preference for one stage primary anastomosis over extraperitoneal resection included Lockhart Mummery, Allen, Chee-

From the Division of Surgery, Mayo Clinic, 600 First Street, S. E., Minneapolis, Minn. Received for publication, September 15, 1945.

ver Joll Gibbon and Hodoe Mayo and his co workers (16 17) MacFee and Woolf

A somewhat analogous situation has developed in recent years in regard to the surgical treatment of those lesions of the lower part of the sigmoid the rectosigmoid and the upper part of the rectum which are distally located as to preclude radical removal by exteriorization. Since the introduction of the Miles operation in 1910 these lesions have been effectively treated by combined abdominoperineal resection or by the less radical posterior resection in one or two stages. Effective though these procedures may be they both entail sacrifice of the rectum and sphincter and with the placing of permanent reliance on an abdominal sacral or perineal colonic stoma. Supported by the pathologic evidence furnished by Gilchrist and David and further extended by unpublished work of Glover that curable malignant lesions of the lower part of the large bowel seldom if ever metastasize in a retrograde manner various surgeons have contrived procedures designed both to cure the disease and to preserve the sphincter. The most substantial proponents of this more conservative type of operation have been Babcock and Bacon (2 3) who have developed a modified abdominoperineal resection and Dixon who has recently described in detail his method of anterior resection.

For several years resection of the right half of the colon has been followed on the service of one of us (J M W) by immediate end to end aseptic ileocolostomy with very satisfactory results. Within the past 15 months we have applied the identical technique of aseptic anastomosis over a three bladed (Rankin) clamp in restoring continuity of the bowel after resection of lesion located variously between the midtransverse colon and the upper part of the rectum inclusive. This report deals with the first 50 cases of this type of resection. We are decidedly in favor of this type of resection in the great majority of instances.

The oldest patient was 78 years and the youngest 15 years of age. The average age of the patients was 55 years. The age range is the customary one for a group composed mainly of patients suffering from malignant lesions. The types of pathology change en-

countered were carcinoma 43 benign tumor (lipoma) 1 localized megalosigmoid tubo-ovarian abscess with involvement of sigmoid 1 diverticulitis 1 benign stricture (post radiary) 1 incarceration in ventral hernia 1—a total of 50.

LOCATION OF LESIONS

By virtue of the location of the lesions in the colon we have classified the cases as follows. Group A comprises those cases in which the lesions otherwise would have been removed by extraperitoneal resection. Group B comprises those cases in which the lesion otherwise would have been removed by combined abdominoperineal resection (Fig 1). The term rectosigmoid requires further definition since several of the standard text books of anatomy make no use of this designation. By rectosigmoid we refer to the segment of the bowel 3 to 4 centimeters long at which the lower part of the sigmoid joins the upper part of the rectum and which is situated at or immediately above the peritoneal reflection.

PREOPERATIVE PREPARATION

Preoperative preparation of the bowel is of especial importance since it is our considered opinion that primary anastomosis should be performed only in those cases in which thorough decompression has preceded the operation. It has been a welcome surprise to find a very small proportion of the cases unsuitable for this operation. Credit belongs to the medical and nursing personnel of the medical colon service who have supervised the preparation of most of these patients for surgical treatment.

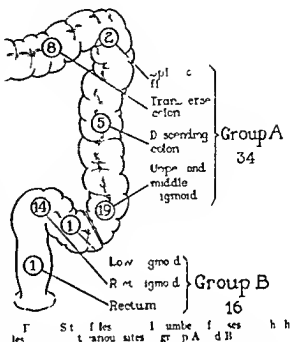
The important features of this preparation consist of (1) subsistence of the patient on a residue free diet for 3 to 4 days prior to operation (2) oral administration of sodium phosphate (3) repeated irrigations of the colon (4) rectal aspirations combined with the administration of camphorated tincture of opium (paregoric) for 24 hours immediately preceding operation and (5) the oral ingestion of succinylsulfathiazole in the amount of 20 grams 5 times a day preferably for the entire 4 day period of preparation.

TECHNIQUE OF OPERATION

Group A For lesions situated in the mid portion of the sigmoid or above the bowel is resected widely above and below the lesion and a correspondingly wide wedge shaped segment of the mesentery is excised with it. The anastomosis is then effected over a three bladed crushing clamp (Rankin) using one row of No 6 chromicized catgut reinforced by a second row of interrupted sutures of No silk. The mesentery is then reapproximated and the posterior and lateral peritoneal reflections are resutured. The incision itself is then closed usually without drainage.

Two technical advantages of this method over extraperitoneal resection are at once apparent. First the bowel may be resected more widely since no portion of it is advanced to the anterior abdominal wall. Thus local recurrence and particularly recurrence in the scar of the incision (a fairly frequent complication following exteriorization) are minimized. Second and also for the reason that the bowel is not brought forward the node bearing mesentery may be resected more widely and approximation of the mesenteries is facilitated a step which prevents internal herniation. Nodal involvement incidentally was discovered in approximately half of the cases of carcinoma (21 of 43 cases).

Group B For lesions situated in the lower part of the sigmoid the rectosigmoid or the upper part of the rectum the technique closely follows that of anterior resection described by Dixon. The bowel is first mobilized and devascularized in exactly the manner that is customary in performing one stage combined abdominoperineal resection. After ligation of the superior hemorrhoidal artery the bowel is manually freed posteriorly from the hollow of the sacrum and if the patient is male anteriorly from the prostate gland. This is an important stage of the procedure since it is here that the surgeon must pause to decide whether he is to proceed with abdominoperineal resection or whether the growth has been mobilized high enough to allow segmental resection with anastomosis. In our experience lesions of the rectosigmoid are almost invariably resectable by the latter method and lesions in the rectum itself



occasionally so. In 1 instance open anastomosis was performed while in the remaining 16 cases the aseptic technique described previously was employed.

Colostomy. Protection of the suture line by proximal colostomy has been advocated by Dixon Rankin Woolf and others. Stone and McLanahan found it unnecessary in the majority of cases the exceptions being those instances in which obstruction was present.

In our series prophylactic colostomy was felt to be unnecessary. In 4 cases previously established colonic stomas were present and were of course left open and functioning until convalescence from the resection was complete. Three of these colonic stomas had been established as emergency decompressive measures and the fourth had resulted from the exteriorization of one of two distinct and widely separated malignant lesions occurring within the same bowel.

There is little question in our minds that colostomy is an unnecessary addition to resection performed for lesions of the sigmoid or above. However our feeling in regard to its use following resection of lower lying lesions is not so definite. We have found that there is some tendency to the development of

edema in and about an anastomosis which is performed after resection in those cases in which the bowel has been freed extensively from the hollow of the sacrum. This we feel is the cause underlying a tendency to the development of temporary partial obstruction in the early postoperative period. In 3 cases in which operation has been performed since the completion of the series that we are reporting this difficulty has been obviated by passing a tube through the rectum and beyond the anastomosis. This tube has been left in place for from 7 to 10 days and has thus far been effective in eliminating obstructive phenomena. It is our intention to employ this tube in the future in all cases of resection of the lower part of the sigmoid and below. In this way we hope to omit successfully the addition of colostomy to the operation performed for group B as well as group A lesions.

POSTOPERATIVE MANAGEMENT

At the conclusion of the operation and before the patient is removed from the operating room the rectum is thoroughly dilated so as to admit three or four fingers. Other means of ensuring patency of the lower part of the bowel such as the insertion of a rectal spool were used in some of the early cases. They were found to be unnecessary. Patients expelled flatus spontaneously within 48 to 60 hours after operation and the bowel ordinarily functions quite normally thenceforward. Patients on whom sigmoidoproctostomy has been performed frequently experience mild diarrhea which ordinarily subsides within a few weeks.

Administration of succinylsulfathiazole in full doses is resumed as soon as the patient is able to take it by mouth. This may be on the day of operation if the operation has been performed with the patient under spinal anesthesia; otherwise it is withheld until the second or third postoperative day. Enough water is allowed with each dose to enable the patient to swallow the tablets. Other fluids are withheld until flatus is freely expelled. Residue free liquids and solids are then employed and continued for the first week of feeding. They are then succeeded by a low residue diet. The amount of food increased

daily so that at the time of dismissal from the hospital (usually on the fourteenth postoperative day) the patient is instructed in a very adequate maintenance type of low residue intake. He is advised to follow this diet in a general way for 2 months and then to liberalize it.

MORTALITY RATE

Two of the 50 patients died giving a mortality rate for this series of 4.0 per cent. One of these died of atelectasis and extensive bronchopneumonia which occurred on the fifth postoperative day and failed to respond to usual measures including parenteral administration of sulfadiazine sodium in adequate amounts. At necropsy the anastomosis (in the rectosigmoid) was found to be in excellent condition. In the other case in which the patient was an elderly woman a fecal fistula developed as well as an associated retroperitoneal abscess which drained inadequately through a stab wound which had been established in the left flank. Her convalescence was prolonged and at several intervals we thought that she was on her way to recovery. Two weeks preceding her death the fistula closed and subsequently her bowels moved normally through the rectum. However as the result of the combination of inadequate drainage of the abscess with extensive cardiovascular disease and a terminal pulmonary embolus this patient succumbed on her forty ninth postoperative day.

The mortality rate for the two groups A and B is .9 per cent and 6.3 per cent respectively. The higher risk associated with the lower group of lesions is probably a real one because of the more extensive procedure involved. However the mortality rate of 6.3 per cent compares favorably with that of Collier and Ransom (8.9 per cent) and Fansler (5.2 per cent) which occurred in the abdominoperineal resections and preservation of the rectum and sphincter was still accomplished.

PALLIATION

In 6 cases hepatic metastasis or nodal involvement beyond the limits of resectability was present and resection was considered a frankly palliative procedure. We feel that the

indication for primary anastomosis is if any thing more certain in such a situation than in dealing with curable disease since these patients are spared the burden of colostomy life during their remaining months

HOSPITALIZATION

Thirty of the 48 patients who survived the operation underwent primary healing and were dismissed from the hospital on the fourteenth postoperative day. The average period of hospitalization for the entire group was 21.4 days. Further analysis of the latter figure however reveals a decided difference in the stay in the hospital between the two group A and B. Whereas twenty five (74 per cent) of the 34 patients of group A left the hospital within 2 weeks only 5 (31 per cent) of the 16 patients of group B were able to do so. The same tendency for a more protracted convalescence in group B than in group A is evidenced by the average hospitalization times which were found to be 30.1 days and 19.4 days respectively. This discrepancy is related to and dependent on the development of perianastomotic edema and a localized type of cellulitis in the anterior sacral space. In those cases in which the bowel has been freed from the hollow of the sacrum there is protracted low grade fever and the patients are fairly often annoyed by the frequent discharge of irritating semiliquid stool. The local edema and inflammation subside however over a period of weeks or months. Only 3 of our patients mentioned a persistence of symptoms when last heard from. It may be that this tendency toward inflammation about the anastomosis will be obviated by the use of the rectal tube as described previously or by establishment of a temporary proximal colonic stoma as advocated by Dixon.

COMPLICATIONS

Complications of varying degrees of severity developed in 10 of the 48 cases in which patients survived. Fecal fistulas developed in 3 instances all closed spontaneously 2 in 3 weeks and 1 in 6 weeks. In 3 other cases all from group B an abscess anterior to the sacrum developed. This abscess drained through the rectum. This complication led to a pro-

longed period of hospitalization but ended with complete recovery in 2 of the cases. In the third case the abscess was draining extensively from the rectum when the patient was last heard from. In one case in which a portion of the sigmoid which had been involved by a large tubo-ovarian abscess had been resected extensive edema of the anastomosis developed. We feel that the edema was related to the original infection. This likewise necessitated a prolonged (77 day) convalescence during which period the patient suffered considerably from cramping abdominal pain and had a persistent fever. However when recently heard from she had undergone substantial improvement although her cramping pain has not as yet entirely subsided. One patient required reoperation on the tenth postoperative day. This was necessitated by the development of a mechanical obstruction of the small intestine which we found to be due to an adhesive band at the site of a former appendiceal abscess. Infection of the incision occurred in one case. We relate this low incidence to the preparation of the bowel with sulfasuxidine and to the use of an aseptic anastomosis. The final complication was a nonfatal pulmonary embolus the patient was a middle aged man for whom palliative resection had been performed. The development of prolonged urinary retention a familiar complication following combined abdominoperineal resection was conspicuous by its absence.

SUMMARY AND CONCLUSIONS

Primary aseptic anastomosis was performed in 50 consecutive cases after resection of lesions of the left half of the colon. Two patients died giving a mortality rate of 4.0 per cent.

For lesions of the middle part of the sigmoid and above this operation provides a safe curative one stage procedure the hospital convalescence from which seldom exceeds 3 weeks. This period compares favorably with the minimum of 8 weeks close supervision and the 3 or 4 separate procedures involved in extraperitoneal resection.

For lesions of the lower part of the sigmoid the recto sigmoid and the upper part of the

rectum this technique provides for the eradication of malignant lesions with preservation of the lower part of the rectum and the sphincter ani. The average period of hospital convalescence from this operation (anterior resection) is approximately 1 month.

1. Preparation with a sulfonyl sulfathiazole and aseptic anastomosis are factors in reducing the mortality rate.

2. Primary anastomosis is the procedure of choice following resection of lesions in the nonobstructed bowel.

3. Proximal colotomy is unnecessary for lesions of the middle part of the sigmoid or above.

4. Proximal colotomy or prophylactic decompression with a rectal tube is indicated when lesions of the lower part of the sigmoid or below are removed.

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PENICILLIN THERAPY IN ABDOMINAL SURGERY

The Results of Prophylactic and Therapeutic Use in Fifty Cases

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THE objective of this report is to point out a limited but definite field of usefulness for penicillin in the prevention and treatment of abdominal sepsis.

Penicillin has not been generally accepted as an effective agent in the treatment of infected surgical conditions of the abdomen. This conclusion is due in part to the few brief and unfavorable reports of its use in peritonitis. Lyons in his summary of cases treated in various United States Army Hospitals states:

Infections arising as complications of appendicitis have not been responsive to treatment although one patient showed improvement coincident with treatment. It seems however that in the few cases reported patients were treated late in the disease—at a time when the infection was widespread and the prognosis poor. Jeffrey in his discussion of the use of penicillin in the British Army remarks that:

Penicillin is usually not of value in penetrating wounds of the abdomen; most of the deaths in such instances are due to physiological causes. In addition, cultures of the infections although frequently mixed usually show a predominant growth of gram-negative bacteria which are not sensitive to penicillin. These nonsensitive organisms also produce penicillinase which inactivates penicillin (Abraham and Chain).

We administered parenteral penicillin to 5 patients critically ill with generalized peritonitis. These patients presented the usual picture of terminal peritonitis with such complications as multiple intraperitoneal abscesses, paralytic ileus, hepatitis, pneumonia, and kidney damage. Treatment was started late and was discontinued after a few days because of scarcity of material. All of these patients died. The only indication that penicillin exerted any favorable effect in these patients was evidenced in the temperature graphs. There was a definite reduction of temperature

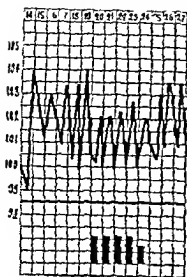
very closely associated with the initiation of penicillin therapy in every instance (Figs. 1 and 2). Because cultures of infected material from these patients contained both sensitive and insensitive organisms, this temperature reduction was attributed to some inhibition of those organisms which were sensitive.

In many open infected wounds of the extremities numerous species of bacteria were isolated from cultures and as in peritonitis the insensitive bacteria were often more prolific. It was found that when the sensitive organisms in these wounds were controlled by means of penicillin, healing did not appear to be impeded by the continued presence of the insensitive bacteria. In peritonitis streptococci or staphylococci can often be isolated along with *Escherichia coli*. These penicillin-sensitive bacteria may easily be overlooked in cultures due to the rapid overgrowth of insensitive organisms. Ladd and Gross frequently found a mixture of organisms in peritoneal cultures and it is their opinion that the bacteriology in cases with abscess or peritonitis is variable. In many such peritoneal cultures there are doubtless important organisms which are lost sight of when there is a luxuriant overgrowth of colon bacillus.

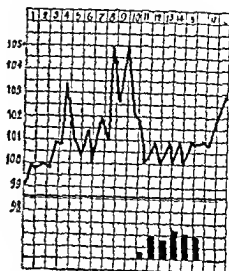
In view of the pathogenicity of gram-positive organisms in other infections, we believe that these penicillin-sensitive organisms play a greater rôle in mixed infections of the abdomen than is commonly attributed to them. Certainly the inhibition of these organisms early before the infection has become widespread should be a factor in the recovery of certain patients.

THE EARLY USE OF PENICILLIN IN PERITONITIS

Twelve additional patients with peritonitis were treated more adequately than were the eleven in the first cases mentioned. Treatment in the majority of these cases was initiated at the



F Staphylococcus aureus and unidentified gram-negative bacilli. Temperature in degrees Fahrenheit. Penicillin administered from day 15 to 21. Sulphonamide administered from day 21 to 27.



F Staphylococcus aureus and Escherichia coli. Temperature in degrees Fahrenheit. Sulphonamide administered from day 12 to 17.

time of operation. Seven received local treatment and parenteral therapy, 3 received parenteral therapy only. Local administration in 3 instances consisted of instilling 50,000 units and in 4 other cases 100,000 units of penicillin into the abdominal cavity by means of a catheter just prior to closure. This penicillin was diluted with 30 to 50 cubic centimeters of normal saline. Parenteral therapy was administered intramuscularly at 3-hour intervals. Dosage was varied from 10,000 units to 100,000 units every 3 hours, totaling 80,000 to 160,000 units every 4 hours. The duration of treatment was quite variable. In 3 instances there was evidence of reactivation of infection after penicillin had been discontinued and an additional course was administered.

These patients also received all other accepted therapeutic measures. Oxygen was administered, the electrolytic, caloric, protein and fluid balances were maintained, distention was combated by continuous gastric suction and the maximum benefit of sulfonamide therapy was obtained. (Because of the serious nature of the infection in these patients we did not feel justified in evaluating penicillin without sulfonamide administration.)

The high and low daily alterations of temperature are only as recorded. Penicillin was administered 100,000 units intramuscularly every 3 hours. Sulphonamide was administered 100,000 units intramuscularly every 4 hours.

The usual numerous laboratory determinations were made but only the significant or unusual results are included in the following summaries.

CASE 1. Male, age 33 years, admitted with a history of having been operated upon because of a ruptured spleen. He had a history of a ruptured spleen 15 days prior to admission. Temperature was 101.2 degrees Fahrenheit. Pulse 120. Tenderness marked over a scar on the lower mid abdomen. The right firm mass palpable beneath the scar. There had been no evacuation of stool or flatulence. Bowel sounds. A diagnosis of carcinoma of the colon was made.

At operation a large inflammatory mass was found in the sigmoid colon. There was a cyst of a perforated diverticulum with a loculation containing a thick, white, cheesy material. The colon was resected and the bowel was exteriorized by a Mikulicz procedure.

After operation the temperature elevated to 102.5 degrees Fahrenheit. Penicillin was started on the 5th postoperative day.

This patient received adequate sulfonamide therapy prior to administration of penicillin. No other changes in treatment were made at the time of penicillin administration.

CASE 2. Female, 36 years, 5 months gestation, admitted with the complaint of generalized abdominal pain. Temperature 101.2 degrees Fahrenheit.

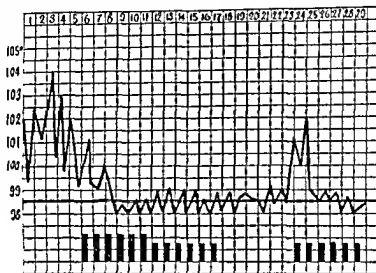


Fig 3 Case II m lytic Staphylococcus c d Esch rich a coli

m n Temperat e was 101.8 d gree p l e 120
The abdomen i d a d tender thr ough ut no
f tal heart tones were a d b l The r v ot
d lated and there was no vag al bl d g Th
white blood co t was 7900 61 pe cent tr ph ls
She del d aponta usly s dd ly hours
after adm s n f flow g d delivery all bd minal
t gns persisted and a d agnos s f periton t s was
made

At operati n a gang eno s perf rat i pp div
was f nlan i removed O r i o o c b u c c t m e
t r s f seropu was aspirated fr m th abd m n
Pen icill n was adm stere il callv (o o o t s)
and continu d par tially

In Case 2 sulfadiazine and penicillin were
administered concomitantly and therefore
evaluation of penicillin effect was difficult
However during the second febrile period sul

fadiazine was administered for a period of 6
days with little improvement Then a se
cond course of penicillin was apparently re
sponsible for immediate temperature reduc
tion and general improvement (Fig 4)

Case 3 Female aged 23 years was admitted
with e mpla nts f nausea duration 4 days and
l w r r ght q adrant abd minal pain duration 3
l y s n et g adual Temperature rose to 104.4 de
g ces p lse as 126 Th pat ent was exhausted
ha i g travelled the 5 d y s prior to admission Sh
w chllng everly

A d agn sis of a perforated append x was made
and this d agnosis was confirmed at operati n Th
append x was rem ved a d fla k dra nage as in
stituted

Pneumonitis d veloped on the nd postoperati c
day There was no impr m nt from sulfadiazine

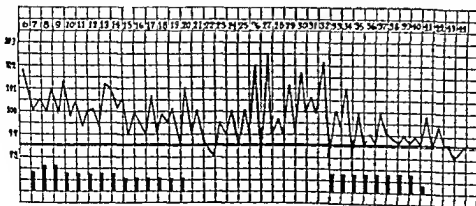


Fig 4 Case I Staphylococcus ven nd Esch rich coli

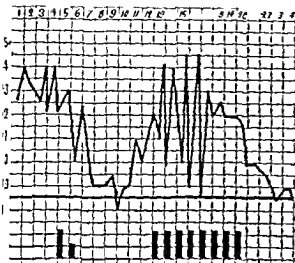


Fig 3 Case 3. An abscess of the chest wall.

th rapid P clln th rap w s start d on the fourth post perat e day but nly cont n ed 2 days. Imp o eme t e med clo ly a c t d with the ad m nstrat f the dru. St tng the 10th po t operat e d v the temperatur ags n gradu lly le vat d d impro d dra na e w s establ h d w th lttle chan e P clln w s gan adm nstr d.

In Case 3 penicillin was administered for only days on the first occasion. It is questionable if treatment over this short period of time was responsible for the marked improvement (Fig 3). The second rise in temperature was associated with abscess formation drainage of which did not appreciably alter the patient's condition. The administration of penicillin at this time produced marked general improvement although there was no temperature reduction for a period of 3 days.

CASE 4. Male aged 39 yrs was admitted with acute abdominal pain sudden in onset duration 12 hours. Temperature was 101.8 degrees F. Leucocytes 15,000. Tenderness a distention white bow pres th o gh o t the bd men were m re maked in the right lwer quadrant.

A diagnosis of a perforated appendix with generalized peritonitis was confirmed at operation. The appendix was removed but was not calcified.

The postoperative course was not satisfactory. The temperature elevated to 101.8 degrees F. The abdomen remained moderately distended. On the 10th post perat e d y he com lained f d s comf rt th pper nht bd men d l w nht chest radat g t r h to the back d crased b deep rat l cu th l cr

tated this distress. A ray films nht stat dem ntrated an egul r s f cread de ty bo e the right diaphragm. A m n f at subc a phragmat c abscess was r port d. The s Ma a e blood le el wa m t ned at about 15 milligrams per cent. The t mperatu e rema ed elevated and the g eral co d t n f th pati t was u t fac t r y.

On the 12th po t op rat e d y post n r r a f th subd aphragm t c abscess was contemp t l d pen clln was itated as a properat m. Ther was sufficient improvment ith n 24 h r st warrant operat e delay. With n 3 days pa a d t nderness nht l r re we r n m l. Th t mperatu e had how e c c e a d t 103.5 degrees. Add t r l x ray p c t res r eal d a n rase in th a e a f d ty in the rht chest. Aspirat n of th rht ple r al ca ty as d ne f th 6th po t perat day co cub c c t m l r s f cludy blood t ged flud b g r m o d O th s me occas n 10000 units of pe clln we e jected intrapleurally. Th t mperatu e c d t 102.2 degrees the fll w n day. Aspirat n wa r peated o the 17th 9th a d 3rd po t operat d ys. Impr mnt s rap d f m the th d y f tr atme t (F 6).

In Case 4 signs of a progressive subdiaphragmatic abscess disappeared during 4 days administration of penicillin. Nevertheless the temperature continued to rise and the signs of pleural effusion increased although the patient was receiving 160,000 units of penicillin daily. The pleural infection was not controlled until penicillin was administered directly into the pleural cavity. The isolation of the same organism from three different sites leaves little doubt as to the pathogenesis of the pleural infection.

CASE 5. Male aged 39 yrs was admitted on the 6th day of illness. Appeared to my M r operat he had a persist n l t n f m r r t e (100- de m es). O t 8th post perat d y an tra ab m l b es w de f th p v i perat t. Th f t b came opt hst mperat r r a bet a d o d es.

On the 10th post perat e d y p t f m h m pl d f r th ht tpe bdom na d l w r nht chest. Th ent l t ported t rht l h m t b l v t l a t n ed. A plural f l wa prs nt l f w th co se of all co sult t that a s b aphragm t abscess w s present.

On dr... pe clln w stat d Th l l t w g a co cub c c t m l r s f l a f l w a p r at f m th rht est. Cl t es f t f d showed o g w th t t t m f 35 rat 10000 units of penicillin w e j d t Th w g r al r p r t f th f t t t t t r s

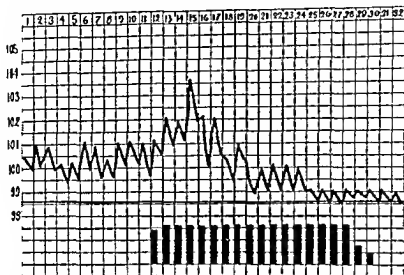


Fig 6 Case 4. A patient with hemorrhagic Staphylococcus aureus culture data from the abdomen and the chest.

although the temperature remained elevated for a short time, it rapidly declined. The patient was allowed up on the 9th day after the operation and recovery was uneventful thereafter.

This patient showed no improvement following chest aspiration and no reformation of fluid. It was believed that the pleural effusion had little bearing on the course. There was no change in treatment and no pus was evacuated from any other site. Probably a subdiaphragmatic infection was aborted by penicillin.

CASE 6. Male, aged 3 years, developed a retroperitoneal abscess on the 6th day following appendectomy. There were associated signs of generalized peritonitis. The abscess was drained but no improvement resulted. Abdominal distention increased and paralytic ileus developed. The temperature rose to 104 degrees.

Following drainage of the abscess, the abdominal signs gradually decreased. The abscess gradually healed and the patient recovered. There was an abrupt fall in temperature.

The infection in this patient was progressive in the face of all other therapeutic measures. Arrest of extension of the infection was closely associated with the initiation of penicillin therapy.

CASE 7. Male, aged 3 years, acute postoperative ileus. The attack of diarrhea which persisted for 5 days. At that time the patient had a moderate to severe dehydration with a fall in temperature.

On the 12th day of hospitalization, following a proctocolic emulsion, he suddenly developed severe generalized abdominal pain. He was transferred to the general hospital. He was admitted in shock with a temperature of 96 degrees, pulse 60, respirations 4, and blood pressure 90/60. He received emergency shock treatment. Examination revealed the abdomen to be markedly distended and rigid and the liver to be enlarged to the level of the umbilicus. He appeared to have general peritonitis.

He was operated upon the day of admission. About 3,000 c.c. of meters of cloudy fluid was

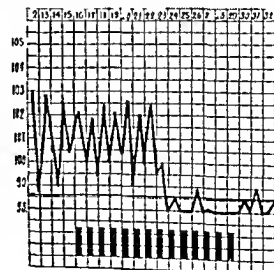


Fig 7. Case 5. Hemolytic Staphylococcus aureus culture from the drainage of abdominal wound.

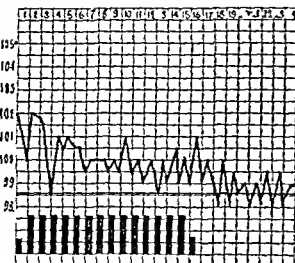


Fig. 3. Case 3. *Staphylococcus aureus* of Escherichia coli.

pirated from the abdomen. There were marked peritoneal exudates. Operative exploration of the intestine disclosed a tract called perforated. The dome of the right lobe of the liver was fluctuant and a collection of purulent exudate was noted in this area. Perforation produced thick pus. Apparently spontaneous drainage of a liver abscess had occurred. A mushroom catheter was inserted through the lateral chest wall into the abscess cavity. No chocolate pus or cysts were found in the evacuated material. Cultures of peritoneal and abscess material had no growth.

Penicillin was administered locally (10,000 units) a day intracavitarily. Treatment was discontinued on the fifth postoperative day because of negative cultures and relief of the patient's symptoms was normal.

His general condition was poor. He eventually developed testicular destruction requiring partial orchiectomy on two occasions.

To monitor the postoperative condition, the deep pelvic fluid was analyzed. It contained 100,000 units of penicillin, 100,000 units of streptomycin, and 100,000 units of bacitracin. The pleural cavity proved further accumulation of this material. Hemolytic streptococci were cultured from the aspirated material and was also cultured from the drain in abscess.

Blood sent to the laboratory in Washington was reported as showing positive complement fixation for malarial parasites and malarial parasites were demonstrated in the blood. It was eventually transferred to a hospital for further treatment.

It was concluded that low improvement in this patient was probably due to extensive liver damage. Penicillin was effective in aborting malarial infection in this patient.

CASE 8. Male aged 22 years, 5 days prior to admission developed cramping abdominal pain which increased in severity. On the third day of illness, symptoms increased, he became nauseated, vomited frequently. He was admitted to a hospital and a distended constipated abdomen for a small bowel obstruction. There was no improvement.

He was operated upon 48 hours after transfer. Three black gangrenous loops of ileum were found where the abdomen was opened. The obstructed small intestine was resected and the ends were anastomosed. An ileal appendectomy was done. A small amount of pus was present and there was leakage of intestinal content. The gangrenous bowel was removed and a double-barreled ileostomy was done. Penicillin was given locally (50,000 units) and continued parenterally.

The postoperative course in Case 8 was surprisingly satisfactory. The wound did not become infected. Due to the high location of the ileostomy, difficulty was encountered in maintaining his nutrition and in preventing skin erosion. Subsequently the ileostomy was closed and a transverse ileocolostomy was done. Recovery was satisfactory.

CASE 9. Male aged 27 years, was undischarged in the hospital as a machine gun bullet was situated between the bladder and the sigmoid colon. The office of a drainage surgeon was contacted with the patient's body was present in the right perineal region. He had partial destruction of the anal orifice.

He was brought to the hospital for partial ileostomy and administration of penicillin parenterally as well as locally into the sinus tract. His condition was deteriorating. The tract before operation was not closed. On the second day following this irrigation, he developed severe abdominal pain followed by increasing signs of peritonitis and testicular obstruction.

At operation, marked peritoneal irritation was found. The distal ileum was dilated, the bowel wall was thick and edematous. One loop was fixed to the pelvis and formed the roof of an abscess in which the foramen body was imbedded. Thick pus was evacuated from the abscess and the bullet was removed. It was necessary to do a resection of 18 inches of the damaged bowel. A double-barreled ileostomy was done. At the end of the operation, 100,000 units of penicillin were injected into the abscess.

The patient was critically ill immediately after the operation but responded rapidly. Postoperative temperature was 101 degrees Fahrenheit on the first day, 99.5 degrees thereafter. There was no evidence of peritoneal irritation. The patient was discharged.

In Case 9, cultures from the sinus tract grew on various occasions: diphtheroids, *Staphylococcus aureus*, streptococci, *Bacillus proteus* and proteus. The course of this patient was even more satisfactory than that in the

preceding case. It is reasonable to conclude that some inhibition of this mixed infection should be attributed to penicillin.

CASE 10. Female aged 22 years housewife was admitted complaining of constant generalized abdominal pain. The onset was sudden 2 1/2 days prior to admission and was cramping in nature. Pain gradually localized to the right lower quadrant becoming somewhat relieved after 18 hours. It again increased in severity and became widespread.

Examination revealed moderate distention of the abdomen was rigid. Pressure and rebound tenderness were marked throughout and somewhat accentuated on the right.

A diagnosis of acute appendicitis with possible perforation was confirmed at operation. A gangrenous perforated appendix was removed. Just prior to closure 100,000 units of penicillin were injected intraperitoneally. The abdomen was not drained. Penicillin was continued parenterally.

The temperature was 100 degrees on the occasion of the following operation but did not go above 99 degrees thereafter. She was allowed up on the 2nd postoperative day and was discharged from the hospital on the 8th postoperative day.

It is interesting to note that the postoperative course in Case 10 was as uneventful as after the average interval appendectomy.

CASE 11. Male aged 65 years 10 days prior to admission developed sudden abdominal cramping. The following day he noted tenderness in the right lower abdomen. On admission the above complaints were still present and in addition he noted weakness and anorexia. Examination revealed a tender fixed mass in the right lower quadrant.

A diagnosis of appendiceal abscess was confirmed at operation. In establishing drainage in the right flank considerable pus was spilled into the abdominal cavity. Smears showed gram positive cocci which were not identified and Escherichia coli. Cultures grew only the latter organism. Penicillin was applied locally (100,000 units) and continued parenterally.

The highest postoperative temperature was 100 degrees. It returned to normal on the 3rd postoperative day at which time the patient was allowed up. Recovery was uneventful. The patient being discharged on the 16th day of hospitalization.

Spillage of pus into the peritoneal cavity during an attempt to drain an intra-abdominal abscess is an indication for both local and parenteral penicillin therapy even before culture reports can be made.

CASE 12. Female aged 3 years was admitted complaining of severe lower abdominal pain gradually in onset during 3 days. She was not treated and constipated.

On examination there was found generalized tenderness more marked in the right lower quadrant. Pelvic examination was painful but no abnormality was palpated. Smears from the cervix revealed only occasional pus cells. There was definite rigidity and rebound tenderness referred to the right lower quadrant.

A diagnosis of perforated appendix with generalized peritonitis was confirmed at operation. The appendix was removed and 100,000 units of penicillin were injected into the abdominal cavity as the abdomen was closed. Cultures grew only Escherichia coli. Temperature was 102 degrees on the first postoperative day subsiding to 99 degrees by the end of the 2nd postoperative day. This patient was ambulant beginning the 4th postoperative day. The recovery of this patient was uneventful.

The postoperative course in 10 of the 12 cases was unexpectedly mild. Of the 3 instances of pleural effusion 2 of which were infected none developed empyema.

Intraperitoneal local administration appears to be of value and there is no evidence to indicate that penicillin should not be administered by this route.

The cause and extent of peritonitis is so variable that a small series of cases such as reported here is insufficient to afford conclusive evidence as to the effectiveness of the drug in this disease. However the improvement which was so closely associated with the institution of penicillin therapy in these cases is presumptive evidence that penicillin was at least a factor in their recovery.

It is well known that penicillin is more effective than the sulfonamides in controlling the staphylococcus (Powell and Jamieson, Robson and Scott and Fleming). Laboratory animals can be protected against intraperitoneal injections many times the minimum lethal dose of various organisms by penicillin as proved for hemolytic streptococci by Hobby, Meyer and Chaffee (5) and for sulfonamide resistant pneumococci by McEee and Rake and Robinson. In view of the frequency with which staphylococci were isolated from cultures in these cases and considering the pathogenicity of this organism in infections elsewhere it seems logical to conclude that penicillin is the drug of choice for combating this phase of the infection in peritonitis. The efficacy of penicillin in staphylococcal infections is of importance not because of a special sensitivity of

staphylococci but because of refractoriness of this type of infection to sulfonamide therapy Dawson and Hobby ()

No cases of primary peritonitis were encountered but considering the frequency with which susceptible organisms are the causative agent in this disease it is probable that here penicillin should be the chemotherapeutic agent of choice

Effectiveness of penicillin therapy in these infections appears to be directly related to the duration of the infection. This clinical experience substantiates the very interesting recent experimental work of Fauley and associates. These naval officers produced peritonitis in dogs by ligating all blood supply to the appendix (All animals that developed internal fecal fistulas were excluded). One group received intramuscular penicillin within 1 hour following operation; the mortality was 0 per cent. The second group were treated after 1 hour; the mortality was 21 per cent. The third group received no penicillin; the mortality was 9.6 per cent.

PREOPERATIVE AND POSTOPERATIVE PROPHYLACTIC ADMINISTRATION

Twenty-five patients with infected wounds received penicillin both preoperatively and postoperatively as a prophylactic measure. Eleven colostomies and 3 ileo tomes were closed. Seven sinus tracts leading to foreign bodies and 4 intestinal fistulas were excised. Extensive surgical procedures were required in several instances. Hernial defects associated with enterostomies were repaired at the same operation.

Treatment consisted of parenteral administration of 10,000 units or 15,000 units every 3 hours intramuscularly for an average of 3 or 4 days preoperatively. Treatment was continued postoperatively until the patient had been afebrile for at least 3 or 4 days. The average duration of treatment was 11 days.

The postoperative course of these patients was very gratifying. The local reaction was minimal in these operative wounds. In no instance did a wound become infected or drain purulent material. The average postoperative course was milder than in similar patients operated upon under the same conditions prior

to the use of penicillin. One complication was encountered following the closure of a colostomy. On the 6th postoperative day this patient developed an elevation of temperature to 102 degrees and there were associated signs of peritoneal irritation. The dosage of penicillin was increased from 10,000 units to 15,000 units every 3 hours and sulfadiazine was administered intravenously. He improved rapidly and his subsequent course was uneventful. The drug which was responsible for the improvement could not be determined.

From this limited experience it is suggested that definitive operative procedures on contaminated wounds may be carried out earlier and with greater safety when penicillin is administered prophylactically.

POSTOPERATIVE TREATMENT OF INFECTED SURGICAL CONDITIONS

PERITONITIS

Case 3. Male, age 35 years, was operated upon for another abdominal perforated gastric ulcer. Postoperative course was unremarkable until the 9th day when the patient developed a fever and the temperature rose to 102 degrees. The patient was given 15,000 units of penicillin intramuscularly every 3 hours. The patient improved and the temperature returned to normal. The patient was discharged on the 11th day.

He was transferred to the hospital on the 10th postoperative day. The patient was given 15,000 units of penicillin intramuscularly every 3 hours. The patient improved and the temperature returned to normal. The patient was discharged on the 11th day.

remained between 104 and 105 degrees for 7 days and gradually reduced thereafter to 100 degrees or less by the 16th day of treatment. Treatment was continued for a total of 36 days; the temperature remaining normal after the 30th day of treatment. Recovery was complete.

No improvement was noted over a 7 week period prior to the use of penicillin, but definite improvement followed soon after initiation of this therapy. This serious postoperative complication was cured by penicillin therapy.

INFECTED OPERATIVE WOUNDS

Seven patients whose wounds became acutely infected following surgery were treated with penicillin. Five of these were infected wounds before operation and these infections were increased by surgery. Two were clean cases which were infected at operation. Cultures of the drainage from the wounds usually grew several organisms, the most constant being *Staphylococcus aureus*. Parenteral therapy was administered as previously described. When possible local application of penicillin (250 units per cubic centimeter) was made by injection through catheters or by packing the wounds with penicillin saturated gauze.

Six of these wounds responded remarkably to treatment. One wound although infected with penicillin sensitive organisms was unaffected. In this case the local edema, drainage and healing were not favorably affected by large dosage—20,000 units every 3 hours. In addition this patient was the only one in this series that manifested sensitivity to penicillin. Forty-eight hours after discontinuance of treatment he developed widespread severe urticaria lasting for weeks.

SUMMARY

Fifty patients with infected surgical conditions of abdomen were treated with penicillin as a prophylactic or therapeutic measure.

It is suggested that penicillin sensitive organisms so often cultured from these wounds are an important factor in the infections.

Twelve cases of patients seriously ill with peritonitis, all of whom recovered, are presented. Further use of this drug as an adjunct in the treatment of this disease is urged. Local administration into the peritoneal cavity apparently has a favorable effect.

Based upon the results in 25 cases, further trial of penicillin as a preoperative and postoperative measure in the treatment of infected abdominal surgical conditions is suggested.

We agree with the suggestion of Fauley and associates that the early administration of penicillin should prove invaluable in the prophylaxis and treatment of wounds of the abdomen. It is stressed that patients should be treated early before wide spread dissemination and localization of infection have occurred.

CONCLUSIONS

Staphylococci, most strains of which are sensitive to penicillin, are a factor in the course of many cases of peritonitis and in postoperative abdominal wound infections.

Penicillin is the drug of choice for controlling that part of any infection which is due to *staphylococci*.

The apparent effectiveness of penicillin in certain cases of peritonitis is sufficient to warrant further investigation.

Infected abdominal wounds in many instances can be operated upon earlier and more safely if penicillin is administered as a preoperative measure. It is our opinion that the disability caused by a long continued infection can here as well as elsewhere be reduced by the judicious use of penicillin.

These observations made at McCloskey General Hospital, Temple, Texas.

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WAR SURGERY OF THE ABDOMEN

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THE risk from wound of the abdomen in World War II is undoubtedly less than in previous wars but that it is yet considerable can be attested to by all who have had experience with them. In an effort to determine the importance of some of the factors influencing the outcome in patients with abdominal injuries a review of our experience in an evacuation hospital during the first year of the Italian campaign is presented. During this period we have been located relatively far forward almost always within 5 to 5 miles of the front and for approximately one half of that time were one of the most forward hospitals. For the other half of the period other hospitals have been in front of us and have usually received the more seriously injured patients.

Our treatment of abdominal injuries has been definitive in character and in most instances complete. Since it is necessary for an evacuation hospital to be ready to receive a rather sudden and relatively large influx of patients we have evacuated patients to general hospitals for secondary operative procedures such as closure of colostomies and the care of infected wounds. Those patients making most satisfactory recovery have likewise been evacuated to the rear for their continued convalescence. We have been able to hold all our patients until they could be safely transported and most of them were well on their way to complete recovery. A postoperative time interval of 7 to 10 days has usually proved sufficient. During occasional periods of great stress evacuation of patients has necessarily been earlier. It is only reasonable to assume that there have been some postoperative incidents and perhaps a few deaths of which we are not cognizant and which can not be included in this report. It is believed however that the mortality figures are practically complete.

We have admitted 471 patients with abdominal injuries of sufficient severity to require laparotomy. Forty-three of these patients

were evacuated to us after their operations in more forward hospitals. There were 3 deaths in the postoperative group. Three hundred and fifty-eight patients were received by us for their initial definitive treatment and form the basis for this study.

PREOPERATIVE CARE

Abdominal injuries are commonly associated with a marked degree of shock and it is imperative to improve the patient's general condition before operative procedures are undertaken. The treatment consists of restoration of the circulating blood volume by the use of blood plasma and whole blood. We have a definite preference for whole blood. The amount given is determined by the patient's response. A systolic blood pressure stabilized above 100 millimeters of mercury is highly desirable. Not uncommonly three or four thousand cubic centimeters of plasma and blood are required in the more seriously injured. These infusions are best given relatively rapidly and two veins are occasionally chosen to expedite their flow. A few hours time may be used to advantage in obtain the maximum improvement provided the possibility of continued hemorrhage and the hazard of delay in closing intestinal perforations are kept in mind and judiciously considered. For the entire series an average of 5 hours elapsed between the time of admission and operation. Much of that delay was due to the not uncommon backlog of a large number of casualties. Rarely was it necessary to elect a period of longer than 3 hours for preoperative treatment.

Concomitant with the improvement in the patient's general condition a careful appraisal of the abdominal catastrophe is made. Particular attention is paid to the location, character and extent of the wounds. The possibility of missiles entering the abdomen from above below from the sides and back as well as from the front must always be kept in mind. Likewise the possibility of subperitoneal intra

abdominal injuries is indicated by the presence of 9 such cases in this group.

When there are penetrating wounds with retained missiles a roentgenographic study is made as soon as the patient's status warrants. The presence and location of the retained missile is of great importance in determining whether or not there has actually been peritoneal penetration and the subsequent planning of the operative procedure.

Examination of a urine specimen is important in determining the presence of injuries to the urinary tract. Rectal examination frequently by proctoscope has often revealed a previously undiagnosed lower bowel injury.

Emptying the stomach by inserting a gastric tube preoperatively has greatly facilitated upper abdominal procedures and diminished the likelihood of aspiration of vomitus.

Preparation of the operative field has consisted of shaving and cleansing with soap and water.

TIME LAG

In spite of our relatively close proximity to the front the interval between time of injury and admission, an average of 11 hours, has frequently been considerably prolonged which can be largely attributed to the difficulty encountered in moving casualties in mountainous terrain.

The time lag between injury and the institution of surgical care has long been considered a major factor in the mortality rate, and it would seem justly so. That time lag is not the most significant factor, however, is clearly shown in Table I. The extent of the injury and the presence of shock are so much more important factors that the time lag itself is eclipsed. It is our impression that infection, which is so markedly influenced by the time interval, has been greatly diminished as a factor in mortality as a result of chemotherapy. Even in the group of cases with perforation of the gastrointestinal tract in which infection might be expected to be the major factor after a prolonged time interval, no such conclusion can be drawn from our experience.

ANESTHESIA

Ether has been the anesthetic agent of choice. Its administration through an endo-

TABLE I—INFLUENCE OF TIME INTERVAL BETWEEN INJURY AND OPERATION ON THE MORTALITY IN 37 CASES IN WHICH THE INTERVAL WAS KNOWN

Time —h	All cases			Case with hollow viscus perforation		
	Cases	Deaths	Survivors	Cases	Deaths	Survivors
Under 1 h						
1-2 h	8					
3-4 h	86					
5-6 h	5			5	3	
7-8 h	3				3	
9-10 h	8					20
11-12 h	8					
13-14 h	8	3	37		3	75
15-16 h	7			5		
Total		3				5

tracheal tube is preferred. The tube affords better control of the respiratory exchange and depth of anesthesia. Operative procedures, particularly in the upper abdomen, are greatly facilitated. It affords the opportunity for turning of the patient for the care of back and extremity wounds with less difficulty than when other methods are employed. The likelihood of aspiration of foreign material is reduced to a minimum and the ease with which secretions are aspirated from the tracheobronchial tree are most important considerations in the prevention of postoperative pulmonary complications. No untoward effects have been observed from its use.

Spinal anesthesia has been used infrequently because of present or impending shock and the frequency of operative procedures which required a longer period of time than the anesthesia would last. Pentothal does not afford sufficient relaxation of the abdominal musculature for its more general use.

MISSILE PRODUCING WOUND

The type of wound and the kind of missile producing it have little or no influence on the mortality as is shown by the following figures. Of a total of 338 cases there were 349 with penetrating or perforating wounds and 9 subparietal wounds. Of the 349 penetrating or perforating wounds there were 233 from shell

TABLE II—RELATIVE MORTALITY RATES IN CASES OF SINGLE VISCERAL INJURY AS COMPARED TO THOSE CASES OF MULTIPLE VISCERAL INJURY

Viscus	Only viscus injured			With associated injury to other viscera			Total		
	Cases	Deaths	Mortality	Cases	Deaths	Mortality	Cases	Deaths	Mortality
Stomach				20					
Duodenum								1	10
Small intestine	5	6		44	5				5
Colon				5			8		
Rectum					5	5			
Liver								5	
Gall bladder						5			
Pancreas									
Lung						60			
Kidneys									
Bladder									

fragment with 49 deaths or a 1 per cent mortality 76 from bullets with 16 deaths or a 20 per cent mortality 14 from mine fragments with 3 deaths or a 21 per cent mortality 2 from bomb fragments with no deaths 3 from stab wounds with no deaths and in 18 cases the instrument of injury was not stated. In these 18 cases there were 2 deaths an 11 per cent mortality. Of the 9 subperitoneal wounds there were 2 deaths or a mortality of 2 per cent. In all there were 72 deaths or a mortality of 20 per cent.

INCISION

The location of the wound and location of the missile as determined by roentgenogram were the chief factors in determining the type of incision to be used. Contrary to a rather common belief that missiles may wander about with most unpredictable consequence it has been our experience that they traverse the abdomen in a straight course and usually the resulting injury may be suspected with a high degree of accuracy. On that assumption the incision is chosen which will afford the best exposure and thereby facilitate the operation.

EXTENT OF VISCERAL INJURY

As shown in Table II the mortality is directly proportional to the extent of visceral injury. In 161 cases with a single viscus in-

jured there were 6 deaths a mortality rate of 11 per cent. In 103 cases with two or more viscera injured there were 4 deaths a mortality of 40 per cent. Such a contrast in mortality is shown for each viscus and is particularly apparent for the upper abdominal viscera. It is believed that the great frequency of multiple visceral injuries in upper abdominal wounds largely accounts for their relative increased risk. In speaking of the mortality from peritoneal visceral injuries it is important to indicate which cases are included. Thus from our experience with 3 patients with wounds of the colon there were 2 deaths a mortality rate of 6 per cent. However in 51 patients with associated injuries to other organs there were 2 deaths a mortality rate of 4 per cent.

WOUNDS OF THE STOMACH

There were one or more perforations of the stomach in 20 cases an incidence of 8 per cent of 56 cases with visceral injuries. In only one case was the stomach the only viscus injured. In 6 cases the spleen was the only additional viscus injured. In 4 cases the spleen and other viscera were involved. The remaining 10 cases are those with associated wounds of the liver, gall bladder, pancreas, small intestine and kidneys in various combinations.

The stomach was approached through a left thoracoabdominal incision in 9 cases and a right

had thoracoabdominal wounds and through an abdominal incision in 13 patients 4 of whom had thoracoabdominal wounds. Simple closure of the perforations was effected by suturing with catgut and occasionally reinforcing with interrupted silk. There was no instance of overlooked perforations or postoperative complications from leakage or bleeding.

There were 10 deaths in this group all of whom had associated injuries to other viscera. In 7 of this group the spleen was injured. All died relatively early following injury and in none was infection a significant factor.

WOUNDS OF THE DUODENUM

There were 10 cases with perforation of the duodenum an incidence of 4 per cent. All but one of these had associated injuries to other viscera.

Closure of the perforations was accomplished by suturing with catgut and reinforcing with silk or cotton. Extensive mobilization of the duodenum was necessary for the exposure and accurate inversion closure of the retroperitoneal perforations. In 2 cases in which this was not done postoperative fistulas developed which were largely responsible for the deaths. A fistula developed and proved fatal in a third patient whose precarious condition did not permit adequate care for and the closure of a perforation.

There were 7 deaths all of which had associated injuries to other viscera. Except for the 3 in which fistulas developed the duodenal injuries *per se* did not seem to warrant the usual hopeless prognosis given them.

WOUNDS OF THE SMALL INTESTINE

There were perforations of the small intestine in 93 cases an incidence of 3 per cent. In 44 of these cases there were associated injuries to other viscera. The number of perforations varied from 1 to 30—with an average of 3.7 per case. The ileum was injured in 46 cases the jejunum in 43 cases and both in 6 cases.

Simple closure of the perforations with catgut was the usual method of treatment. When it was thought that simple closure of multiple perforations in a relatively short segment of the bowel would result in a mechanical obstruction

or prove too time consuming, the involved segment was resected and an end-to-end anastomosis was done. Resection was done in 7 cases. In 3 of these cases 2 segments were resected and 2 anastomoses were done and in one 3 resections and anastomoses. There were no serious postoperative complications (fistulas, leakage or obstruction) from these procedures during the period of our observation. From the viewpoint of mortality our experience, although too limited to be conclusive, fails to show the increased risk of resection and anastomosis over simple closure as we have employed them and in spite of the usual greater degree of injury at least to the small intestine in the group having resections.

In 1 case with only the small bowel involved there were 6 deaths. In 44 cases with associated injuries to other viscera there were 18 deaths. The mortality from ileal wounds, 13 deaths in 46 cases, was somewhat greater than that from jejunal ones (10 deaths in 43 cases) but that fact was of doubtful significance on detailed case study.

WOUNDS OF THE COLON

The colon was involved in 83 cases an incidence of 28 per cent. In 51 cases there were associated injuries to the other viscera. In 5 cases two segments of the colon were injured.

The procedures employed in the colon cases were more varied than were those for the small intestine. Because of the relative immobility of the colon, closure of large perforations and resection with primary anastomosis as are used for small bowel injuries are more difficult and time consuming and consequently more hazardous. Too the colon may be exteriorized with less distressing and disturbing consequences to the patient than can the small intestine. The contention of those who hold that all wounds of the colon should be exteriorized because of its poor healing tendency and the greater than apparent tissue damage from heel fragments is not supported by our experience. Primary suture of perforations in 5 cases was done without difficulty arising from lack of their remaining closed. The inconvenience of a colostomy, the saving in nursing care, the avoidance of prolonged hospitalization and the avoidance of

in their major operation with a great likelihood of colonic fistula in primary closure are obvious advantages. Equally obvious is the advantage of quickly exteriorizing a badly damaged segment of colon particularly if its blood supply is questionable. The procedure used should be determined chiefly by the extent of the injury.

There were 4 deaths in this group of 6 cases with exceptions all deaths were in patients having associated injuries to other viscera (31 cases).

WOUNDS OF THE RECTUM

The rectum was injured in 6 cases an incidence of 1 per cent. In 2 cases it was the only viscus injured in the remaining 4 cases there were associated injuries to other viscera—the bladder in 3 cases the sigmoid in 1 case and the small intestine in 3 cases. In 7 cases the rectum was perforated above the peritoneal reflection.

Sigmoid colostomy and free drainage of the presacral region with excision of the abscess and closure of the perforation when possible were done in all patients with perforations below the peritoneal reflection with a single exception. This patient had a large sacral wound which it was believed would afford adequate drainage. Although he had fractures of both legs and his general condition was never satisfactory at autopsy it was thought that the inadequately drained presacral infection was the chief factor in his death. In the 4 cases with perforations above the peritoneal reflection the perforations were closed and a proximal sigmoid colostomy was done. Three of these patients either had or were suspected as having an additional perforation lower down in the rectum and had presacral drainage from below. In performing the colostomy it is essential to construct a pure and transect the bowel in order completely to divert the fecal stream. Postoperative cleansing of the distal segment of feces by means of daily irrigation diminishes the likelihood of pararectal infection and also facilitates healing of the rectal wound.

All deaths in this group with two exceptions occurred in those patients with associated visceral injuries.

WOUND OF THE LIVER

The liver was injured in 10 cases an incidence of 4 per cent of all cases having visceral injuries. In 8 cases it was the only viscus injured and in the remaining 2 cases there were associated visceral injuries. The extent of the injury varied from a slight penetration with little hemorrhage to extensive lacerations with massive hemorrhage. In 4 additional cases in which the small (1 than 0 cm in diameter) recent encephalic study revealed much apparently retained in the liver and in which there was no clinical evidence of other visceral injury exploration was not done. The 4 patients recovered uneventfully. In carefully selected cases such conservatism seems justified.

Wound of the liver were drained routinely with a pack of dry gauze in a Lento catheterette drain which was brought out through a stab wound usually placed in the flank. The drain was left in place for 7 or 8 days then gradually removed. In only 3 or 4 cases was there significant biliary drainage following removal of the drain. Abscesses deeply imbedded in the liver were not disturbed. Fragments of liver were removed. Suturing of laceration was not attempted.

In the 35 cases with only the liver injured there were 4 deaths whereas in the 3 cases with associated visceral injuries there were 14 deaths. Liver wound like that of other single visceral injuries has a surprisingly favorable prognosis.

WOUND OF THE GALL BLADDER

The gall bladder was injured in 4 cases an incidence of 1 per cent of those having visceral injuries. In an additional case it was in close proximity to hepatic bed but the viscus as otherwise intact and required no particular treatment other than suturing back in place. There were associated injuries to the abdominal viscera in all cases. In fact the gall bladder injury was considered rather incidental and presented no great problem. Neither did it appear to be an important factor in the deaths that occurred in this group. In 3 cases with perforation of the gall bladder a catheter cholecystostomy was done. In the fourth case the viscus was so extensively lacerated

erated that cholecystectomy was the procedure of choice.

WOUNDS OF THE PANCREAS

The pancreas was injured in 13 cases an incidence of 3 per cent of all cases with visceral injuries. In only 2 cases was it the only viscus injured 11 having associated injuries to other viscera. In an additional case there was a rupture of a pancreatic cyst from a subperitoneal injury.

Wounds of the pancreas were routinely packed and drained by use of a wick through a Penrose drain brought out through a stab wound. In no case was there drainage of sufficient pancreatic secretion to irritate the skin.

Although too few cases to be conclusive injuries to the pancreas do not appear to warrant the grave prognosis usually given them.

WOUNDS OF THE SPLEEN

The spleen was injured in 36 cases an incidence of 13 per cent of all cases having visceral injuries. The severity of the injury varied from slight lacerations or penetrations to extensive lacerations. In like manner the hemorrhage from the splenic injury varied from slight to massive. In 16 cases the spleen was the only viscus injured. In 20 cases there were associated visceral injuries.

Severe injuries to the spleen with active hemorrhage demand more urgent operative intervention than do wounds to other viscera and when the abdomen is opened care of the bleeding splen should receive priority over that for other visceral wounds. The surgical approach may be either through the chest and diaphragm or from below, preferably through a subcostal incision. In 19 cases all of which had thoracoabdominal wounds the approach was through the chest. In 17 cases 10 of which had thoracoabdominal wounds the approach was through the abdomen. A subcostal incision was used in 11 cases a rectus incision in 6 cases. In 21 cases splenectomy was done. In 15 cases in which wounds were relatively slight and there was no active bleeding at the time of operation the spleen was not removed. Conservatism in this latter group seems justified although there were 7 deaths all were

attributed to associated injuries of other viscera and at autopsy in no case was there found evidence of further hemorrhage from the spleen. The possibility of secondary hemorrhage in those patients recovering later than our period of observation has been recognized however no instance of such is known to have occurred.

The seriousness of splenic injuries particularly when associated with injuries to other viscera is shown in the fact that in 20 such cases 12 died. The mortality for the entire group was 44 per cent or 16 of a total of 36 cases.

WOUNDS OF THE KIDNEYS

The kidneys were injured in 41 cases an incidence of 14 per cent of the group having visceral injuries. The right kidney was involved in 3 cases the left in 17 cases and in 1 case both were injured. The presence of renal injury was almost always suspected from the location of the wound of entry and the location of the missile by roentgenogram. The presence of gross hematuria was a frequent finding in this group. The wounds varied from slight contusions, ruptures and penetrations to extensive lacerations. There were associated injuries to other abdominal viscera in 29 cases only 12 patients having injury to the kidneys alone.

The traumatized kidney in our experience is best exposed through a subcostal incision. This incision was used in 16 cases a rectus incision in 16 cases a flank incision in 6 cases and a transthoracic approach in 3 cases.

In 16 cases the injury was sufficiently extensive in the opinion of the surgeon to warrant nephrectomy. In the remaining 25 cases more conservative procedures such as a gauze pack or drain in 16 cases renal suture in 4 cases and nephrostomy in 1 case were used. In 4 cases the injury was found to be of such slight degree as to require no particular treatment. In no patient having these conservative procedures was there significant postoperative renal hemorrhage or infection while under our observation.

There were 17 deaths in this group of 41 cases a mortality rate of 41 per cent. In the 12 cases with only renal trauma there were 4 deaths neither of which was attributed to the

renal injury *per se*. There were 5 deaths in the patients not subjected to nephrectomy. This of doubtful significance however since they had extensive associated visceral injuries. The fact that a less severely injured kidney can be saved without undue risk of subsequent morbidity is sufficient justification for conservation whenever possible.

WOUNDS OF THE BLADDER

The bladder was injured in 13 cases an incidence of 5 per cent of the group having visceral injuries. In 1 case the bladder only was involved in 4 cases the rectum was injured in 4 cases the small intestine was injured and in 2 cases the small intestine and rectum were the sites of associated injury.

Suture of the bladder perforation with a suprapubic cystostomy and a drain to the pace of Retzius was the routine employed.

There were 2 deaths in this group. One death was a result of shock following a large shell fragment wound through the sacrum, rectum and bladder and in spite of massive infusions of whole blood and plasma. The other death was the result of an associated perforation in the small intestine which was not discovered at operation.

WOUND OF THE URETERS

Of the 86 cases with visceral injuries only in one was there a severed ureter. This patient had a gunshot wound perforating his left thigh, pelvis and right buttock. There were compound comminuted fractures of the left femur and multiple fractures of the pelvis. At operation he was found to have a perforation of the distal ileum, the base of the bladder was extensively lacerated and the right ureter was severed about 4 centimeters above the ureterovesical junction. The ureter was reimplanted into the bladder. Closure of the lacerated bladder was incomplete and a drain was inserted down to it. A suprapubic cystostomy was done. Except for some urinary drainage from the bladder wound his postoperative course was uneventful.

THORACIC ABDOMINAL WOUNDS

There were 26 thoracic wounds of the thorax and abdomen in 103 cases. These wounds

were caused by a single missile with penetration of the diaphragm or by 2 missiles in the chest, the thoracic and abdominal missiles were caused by separate missiles.

In the treatment of these cases consideration of the chest wound has received priority particularly if there was respiratory difficulty. Once that difficulty was relieved and the general status of the patient permitted the abdominal injury was cared for.

The choice of operative approach to the abdominal injury is a point about which there is much controversy but in our experience of doubtful importance.

There were 31 deaths in this group of 103 cases of the deaths occurring in patients who failed to survive long enough for their surgery to be undertaken. Although the mortality rate for cases with thoracoabdominal wound is slightly greater than that for the entire series it is not remarkably different from wound involving the upper abdominal viscera with which the comparison should be made.

Thus it may be concluded from our experience that the thoracoabdominal wound carries about the same prognosis as those involving the upper abdominal alone once the respiratory disturbance if present is relieved. The choice of operative approach has no apparent significant relationship to the mortality.

NO VISCERAL INJURIES

The abdomen was explored with a finding significant injury to a visceral organ in 64 cases. This group undoubtedly would have fared better with a laparotomy and in our desire not to err on the other side which did not occur perhaps a few were subjected to operation without sufficient justification. In 20 cases a retroperitoneal hematoma was found at operation which gave rise to abdominal tenderness and some degree of muscular spasm which in addition to a penetrating wound usually of the back made laparotomy seem advisable. In 1 case exploration of the abdomen was done because of recent graphic evidence of a fore body positionated that it could not be certain whether or not it had penetrated the peritoneum. This number would be considerably larger were it not for our policy of

TABLE III—EFFECT OF CHEMOTHERAPY IN 43 CASES WITH PERITONEAL
CONTAMINATION OF WHICH 157 CASES HAD NO LOW VISCERAL PERFORATION

D	P l dm	All case	De h	Case with h flow in ceral peri	D h	De h f m nu	De h f m p pe tou
Su fonnard	Loc l l nous d ral	60		5			
Nonamades	In venou don t			4			
S t an lam d and pe II	Loc l l muscu!	60		5	0	3	
P l I	Loc l d l m scul		5		5		
P l II	I m w l	5			8		
	T l			5			7
	P						

debriding and exploring such questionable wounds primarily. In many instances the missile has been found extraperitoneally obviating the necessity for laparotomy. In 14 cases with penetrating wounds of the anterior abdominal wall and muscular rigidity the peritoneum had not been penetrated. In 6 cases with penetrating chest wound and marked rigidity of the abdomen in which the missile was found on roentgenogram to be situated questionably just above or below the diaphragm and in perforating chest wound in which the missile may have also perforated the diaphragm the abdomen was explored and found negative. The frequency of finding abdominal rigidity associated with purely chest wounds was considerable and the 6 minutes were made in spite of our cognizance of the fact. In 3 cases there was massive destruction of the abdominal wall from large shell fragment but the peritoneum at laparotomy was found intact. One of these cases developed a fulminating clostridial infection in a large flank wound which proved fatal. The only other fatality was the result of a pharyngeal perforated vomitus before recovery from the

СЛУЖОТНЕРЪ МРЪ

There can be little doubt that clomethal has played a significant rôle in the low incidence of peritoneal infection following abdominal injuries. Table III shows our experience with clomethal in 4 cases which proved peritoneal penetration or with perforation of the intestine from subparietal injury.

In 11 patients receiving ulfonamides there were 3 deaths attributed to preventable per-

itonitis. In 131 patients receiving penicillin there were 4 deaths attributed to preventable peritonitis.

TABLE IV.—ANALYSIS OF DEATHS

C u fides h	Case	R m h
hook	36	<p>d de h occu red h p p r r v v e</p> <p>i m m i t t e n t</p> <p>i r r i l l i n g p e</p> <p>m l f h p e</p> <p>d m m i y hou im on to</p> <p>ion, g b</p>
		<p>j p e had d f f e r r a i</p> <p>pe on look d p e f m r on Aa</p> <p>ie pe bev h w k</p> <p>ie in ad h on mod r a pe</p> <p>tu i f p</p> <p>Average un lag b er sup</p> <p>pur y im oo h w im</p> <p>on pera</p>
Full		<p>fos l bro h p eumo l m s</p> <p>abl b as 4 3 ase</p>
Besta		<p>Aph s o m a p m l</p> <p>ase Aph m l og</p> <p>case Convuls t ! be</p> <p>white les sea.</p>
	7 1	<p>d eveloped f. last l i o n p e</p> <p>pa of disoidal pe na</p> <p>pa un develope d a l i m</p> <p>ove looked d uenal 10</p>
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foration and one never recovered from profound shock. It was felt that these 3 cases could not reasonably be charged against the efficacy of chemotherapy. The dosages of the drugs used were sulfanilamide powder 3 to 10 grams locally, sodium sulfadiazine 1 gram each day intravenously, sulfadiazine 1 to 4 grams daily orally, penicillin units 30,000 locally and penicillin units 25,000 every 3 hours intramuscularly. They were given for a period of a week or 10 days or until the danger from peritoneal infection as determined from clinical progress had passed.

POSTOPERATIVE CARE

Careful attention to the details of postoperative care is of the utmost importance to the severely wounded patient. Since most of these patients have been in some degree of shock preoperatively and replenishment of the circulating blood volume has been started on admission to the shock ward, it has been our practice to continue the infusions during the operation and postoperatively until the hematocrit and hemoglobin determinations approach normal. The gastric tube inserted preoperatively is connected to a Swanstein apparatus and suction is maintained until effective peristalsis is established. Parenteral fluids, plasma and vitamins are given until liquids are tolerated by mouth. Chemotherapy has been used as described. Particular alertness to the development of pulmonary complications is necessary. Encouraging coughing, turning of the patient frequently and occasional tracheal aspiration as well as bronchoscopic aspiration undoubtedly have prevented many serious complications. In spite of chemotherapy, infection of the operative and missile wounds has been a common occurrence and an occasional intra-abdominal abscess has developed. Early detection and the prompt institution of drainage of these infections are most important. Drains and sutures are usually removed prior to evacuation of the patient. Whenever retention su-

tures are used, however, they are frequently left in place until the patient arrives at the base. There have been three wound disruptions in this group while under our observation which required secondary closure.

ANALYSIS OF DEATHS

As shown in Table IV, exactly one-half of the deaths were attributed to shock. Many of those attributed to other causes had a high degree of shock and their resistance was diminished as to preclude their recovery from relatively minor disturbances. It is our impression that the term shock inadequately expresses the true condition because the status of the circulation as determined from the blood pressure and pulse rate may seem adequate but the diminished vitality from extensive wound with some relatively minor complication will result in a fatality. The final diagnosis, died of wound, is probably as accurate as any in the present state of our knowledge.

SUMMARY

1. A review of 358 patients with abdominal injury admitted to an evacuation hospital during the first year of the Italian campaign has been presented.

The extent of the intra-abdominal injury is the most important factor relative to the mortality. Time lag before operation, type of missile and principal vessels involved except for pleenic injuries are overshadowed by it and appear relatively insignificant.

Shock was directly responsible for half of the deaths and was at least a secondary factor in many of the others. The importance of giving large amounts of blood and plasma over an average preoperative period of hours.

2. Infection, peritoneal, retroperitoneal and pulmonary was responsible for about one-fourth of the deaths. It is believed that chemotherapy has favorably influenced this factor.

The sulfonamides and penicillin appear about equally effective in the prevention and treatment of peritonitis.

GUNSHOT WOUNDS OF THE SPINE

Observations from an Evacuation Hospital

JAMES L. LOOL, M.D. Major, MC AUS New York New York

DURING the years 1943-1944 157 patients with gunshot wounds of the spine were admitted to an evacuation hospital while on active service in North Africa, Italy, and southern France. The following report deals primarily with the surgical management in the 35 cases (61.4 per cent) in which laminectomy was done.

Of the 35 laminectomies 3 were cervical, 16 thoracic, 14 lumbar, and 2 sacral. The neurological status showed appreciable postoperative improvement in 30 cases (85.7 per cent). Of these 30, 1 were lumbar wound, 5 thoracic, 16 lumbar, and 8 cervical. Eleven patients (31.4 per cent) showed no postoperative improvement. There were 4 postoperative deaths in hospital giving an operative mortality rate of 11.4 per cent. The highest mortality occurred in the combined chest-pine wounds (2 fatalities of 6 such cases). The highest incidence of neurological improvement was noted in the lumbar cauda equina group (11 of 14 cases). The dura mater was intact in 4 cases and lacerated in 11. One spinal cord abscess was encountered and of 2 cases in which a sizable shell fragment was removed from the substance of the spinal cord one showed no postoperative progress while the other showed dramatic neurological improvement. Ten patients were considered to be suffering from irreparable spinal cord contusion. The spinal cord lesions due to accidental rather than gunshot wounds are not included in this series.

History. Experience with spinal injuries due to gunshot wounds has demonstrated the fact that the clinical findings, lumbar puncture, and x-ray studies (even though there is still) do not always give a true estimate of the intraspinal path of the bullet nor of the prognostic possibilities. For these reasons each patient should be given the benefit of a laminectomy. Dramatic results having been obtained in the little hope for such has been entertained. One paraplegic soldier for example was pre-

rated upon 4 weeks after being wounded at which time a thick epidural cuff of fibrous tissue with incorporated bone chips was removed from the level of the 9th thoracic vertebra. Neurological improvement began the first day after operation and continued until the patient began to walk 3 weeks later.

On the principle therefore that there is everything to gain and little to lose in this class of war wounds laminectomy is encouraged.

INDICATIONS FOR LAMINECTOMY

The three cardinal indications for laminectomy in compound fractures of the spine are for (1) relief of root pain, (2) closure of lacerated dura (potential avenue for intrathecal infection), (3) decompression of the cord or cauda equina (probably the least urgent of the three).

1. Relief of root pain is important in two counts. In the thoracic level it may seriously retard respiratory excursions of the chest wall and discourage coughing—which is essential for adequate expulsion of intratracheal mucus. In the lumbar level intense prolonged root pain may through reflex cardiorespiratory arrest or shock cause death.

In support of the first statement a case may be cited (unfortunately not seen by a neurosurgeon) in which autopsy revealed a large cluster of ragged bone chips entangled among the roots of the cauda equina following gunshot wound at the 4th lumbar vertebra. Despite heavy sedation and morphine this patient suffered almost unremitting agonizing pain in both legs causing him to scream aloud. Death occurred within 4 hours of the injury and was believed to be the result of reflex shock occasioned by the acute pain and traumatic stimulation of the affected nerve roots.

Four of 5 patients having similar severe root pain were operated upon with immediate postoperative relief. The condition of the 5th

foration and or never recovered from profound shock. It was felt that these cases could not reasonably be charged against the efficacy of chemotherapy. The dosages of the drugs used were sulfanilamide powder 5 to 10 grams locally, sodium sulfadiazine gram each day intravenously, sulfadiazine grams 1 four times daily orally, penicillin units 50,000 locally and penicillin units 500,000 every 3 hours intramuscularly. They were given for a period of a week or 10 days or until the danger from peritoneal infection as determined from clinical progress had passed.

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tures are used, however, they are frequently left in place until the patient arrives at the base. There have been three wound disruptions in this group while under observation which required secondary closure.

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SUMMARY

1. A review of 338 patients with abdominal injury admitted to an evacuation hospital during the first year of the Italian campaign has been presented.

The extent of the intra-abdominal injury is the most important factor relative to the mortality. Time lag before operation, type of missile and principal vessels involved except for splenic injuries are overshadowed by it and appear relatively insignificant.

3. Shock was directly responsible for half of the deaths and was at least a secondary factor in many of the others. This in spite of giving large amounts of blood and plasma over an average preoperative period of 5 hours.

4. Infection, peritoneal, retroperitoneal and pulmonary was responsible for about one-fourth of the deaths. It is believed that chemotherapy has favorably influenced this factor.

The sulfonamides and penicillin appear about equally effective in the prevention and treatment of peritonitis.

along the course of each metatarsal usually resulted in low vermicular response of that toe more widespread sweeping plantar stimulation would evoke a similar response in several or all the toes of that foot. An appreciable delay was noted between the time of plantar stimulation and the evoked toe response which seemed definitely reflex rather than mechanical in character. Abdominal reflexes were not obtained in these patients. The levels of unequivocal cord transection in these cases were at the 2d cervical 2d 4th 6th and 7th thoracic vertebrae.

The delayed vermicular plantar toe reflex demonstrable in patients having a complete cord lesion would seem to be at variance with the commonly accepted views on cord physiology which teach that the initial findings are total areflexia below the affected level due to spinal cord shock. Another exception to this rule was the patient having total sensory and motor paralysis below a cord abcess at the 7th thoracic vertebra who was subject to frequent spontaneous painful contractions of thighs and legs not unlike the mass withdrawal reflex seen in long standing cases of cord transection. Yet in this instance these contractions were apparent during the first 20 days after injury. It is hoped that other observers will seek for similar signs in similar cases so that a proper explanation and evaluation may be arrived at. Another neurosurgeon has already mentioned (personal communication) seeing these motor responses in some of his early cord cases.

COMPLICATIONS ASSOCIATED WITH SPINAL INJURIES

Chest complications. Hemopneumothorax and pulmonary contusion have been associated either unilaterally or bilaterally with 6 of the 16 thoracic spinal wound subjects to laminectomy. Four of the 6 patients had a stormy postoperative course even though they appeared to be satisfactorily general condition prior to laminectomy. The latter evidently improved in addition to strain in an already burdened cardiorespiratory system manifested by intermittent hiccups and dyspnea of variable degree regardless of effort to control them with repeated thoracentesis and intrapleural

ral catheters oxygen transfusions nasopharyngeal and intratracheal suction etc. Two of the 6 cases proved fatal.

Some of the presumed alterations in physiology encountered in this type of case include: (1) incomplete expansion of the lungs due to residual hemopneumothorax or pulmonary contusion (2) curtailed oxygenation due to respiratory embarrassment occasioned by paralysis of the intercostal and abdominal musculature (3) faulty expulsion of mucus because of difficulty in coughing owing primarily to inability to fix the thoracic cage and abdominal muscle as a preliminary to the act of coughing (4) tendency to postoperative pulmonary congestion on these accounts (5) possible reduction of normal systemic blood pressure response similar to that sometimes seen after spinal anesthesia due to the flaccidity of the paralyzed half of the body.

Precautionary preoperative measures might well include the following: (1) Allow ample time for fullest possible stabilization of the cardiorespiratory system before laminectomy. (2) Encourage deep breathing and coughing on regular schedule. (3) Insure adequate blood volume red blood cell count and hemoglobin values. (4) Resort to a scrupulous and if need be heroic use of nasopharyngeal and intratracheal catheter suction or when indicated bronchocopy. All of these latter measures have been used with obvious benefit and success thanks to help from the chest specialist. (5) Epileptin preoperatively may serve to counteract a tendency to hypotension occasioned by flaccid paralysis.

Abdominal complications. Intra-abdominal hemorrhage perforation of bowel or laceration of kidney are urgent indications for operation that should precede laminectomy.

Of the 14 compound comminuted fractures of the lumbar spine 6 required major surgery other than laminectomy 4 nephrectomies 1 kidney exploration 1 laparotomy. Four of the 6 who improved after laminectomy 1 showed no improvement and 1 never recovered due to pulmonary embolism.

OPERATIVE TECHNIQUE

Little need be added to the extensive literature on the subject of operative technique

It is suggested however that normal dura be exposed above and below the site of injury so that dissection can be carried thence up to the actual point of trauma with least hazard to cord and nerve roots. It is usually safer to avoid opening the dura in potentially infected wounds unless there is an evident block or underlying hematoma. When the dura is lacerated it should be opened widely so as to ensure removal of all bone and metal fragments, clots or clothing that may be driven into the spinal canal. Nerve roots that are completely torn should be cleanly trimmed and their cut ends secured if necessary with silver clips. This procedure effectively alleviates postoperative root pain. It is probably best to avoid using the electrocautery in close proximity to cord or roots lest its disseminated heat further damage these structures. The dura should always be closed as it is evident that the incidence of meningitis is thereby appreciably cut down. Dural repair may be accomplished by direct suture or by a fascial dural or fibrin film patch. In the closing of a badly contaminated wound it is best to leave the skin uncutured and approximate only the deeper muscle layers. When extensive loss of tissue makes muscle closure impossible it seems best to close the skin and to leave a drain in the wound for 4 to 48 hours. Contact of sulfa drugs with the spinal cord had probably best be avoided. Diluted penicillin however has proved harmless and effective when introduced intrathecally and has been frequently used in this manner in this series.

Spinal fusion has been resorted to on only 1 occasion. In this prisoner of war a machine gun bullet had penetrated the back cutting across part of the cauda equina at the 1st lumbar vertebra then lodging firmly within the body of that vertebra. The wound was grossly clean, the destruction of the vertebral body considerable so that it seemed both safe and expedient to pack clean bone chips (from the adjacent spinous processes) firmly into the wound flood with penicillin solution and close tightly. The patient made an unusually rapid recovery following surgery promptly and rapidly neurological improvement so that it was felt that he would virtually be able to walk and void reasonably well. Roentgen

ograms taken 2 weeks after operation showed no signs of osteomyelitis.

Postoperative care. The usual measure should be taken including frequent turning, the aspiration of mucus as indicated, and sulfadiazine or penicillin or both as preventive chemotherapy. The leg should be elevated when the patient is paraplegic (1) to avoid overstretching of muscles (2) to avert undue venous stasis and the risk of consequent thrombophlebitis. Active and passive exercise should be encouraged and an ambulatory patient assigned to this task in busy hospital. Suprapubic cystostomy has proved desirable in all patients having partial or total bladder paralysis. When these patients are transferred to a general hospital tidal drainage can be instituted.

COMMON CORD LESIONS

The common cord lesions seen in this series include the following: spinal cord concussion, contusion, crushing, laceration, hematoma, and mechanical physiological block. Combinations of some of these conditions have been observed in several cases sometime leading to difficulty in establishing a correct classification.

Concussion. Sign and symptom of partial or complete cord dysfunction at the level of injury which as a rule begin to clear away within a few hours at most following injury and clear completely by the end of 3 to 5 days. The condition is usually the result of an impact directed against a vertebra whence the force is transmitted to the cord. The muscle may however pass the spinal canal without touching a vertebra more often it passes through a part of a vertebra or ricochet off it. Thus there may or may not be an associated fracture. Generally there is no dural penetration though the dura may be struck or grazed. The often linings of a detached bony chip (the nucleus) of the cord probably exert temporary disturbance of neuroplasmic activity and all in a minute (acceleration) of the stoppage in.

Contusion. Signs and symptoms of persistent usually indicate more lasting if not permanent cord damage due to direct physical rather than physiological cell trauma.

ma or associated chemic and hemorrhagic changes or both. The injury is essentially the same as that described for concussion but more drastic. A contused cord may be soft, muhly and edematous at the site of injury and may or may not look swollen or hemorrhagic depending on the type and severity of the injury.

Crushing, lacerating or hemorrhagic (hematomyelia) cord lesions may simulate concussion or contusion from the clinical standpoint but can usually be readily recognized on direct inspection at operation or autopsy.

Abscess. Abscess of the midthoracic cord was encountered only once in this series. Laminectomy was done for a total cord lesion at the level of the 5th thoracic vertebra. There was partial spinal fluid block, xanthochromic fluid and 4 plus protein. The patient had been wounded 20 days prior to operation by a bullet that perforated the right pleural cavity before fracturing the 7th thoracic neural arch. There were no clinical or cerebrospinal fluid signs of meningitis. At operation the cord at the level of injury appeared softened, partly cystic and unusually mushy throughout its entire diameter for a longitudinal distance of 1.5 centimeters. Culture grew staphylococcus, numerous micrococci and gamma streptococci. Penicillin was placed in the wound before the dura was completely closed. The patient recovered with no change in neurological status and without meningitis.

MORTALITY

In the 3 operative cases reported there were 4 deaths in fatalities; patients had lesions of the thoracic spine and 2 of these had associated chest wounds. The causes of death were:

1. Pulmonary embolus secondary to thrombophlebitis of left femoral vein. Laminectomy was performed for severe compound comminuted fracture of 1st lumbar vertebra with laceration of most of the nerve root at the level of the body distal to the level at right lumbar dissection; the patient also had transient meningitis (culture not reported) which was no longer clinically present at time of death; it was therefore evident that the fatal pulmonary embolus since operation the patient had

been receiving sulfadiazine by mouth and penicillin (intramuscular and intrathecal administration).

2. Hemopneumothorax, persistent despite indwelling intrapleural catheter and frequent thoracenteses. Laminectomy was done at the 6th thoracic vertebra. Contusion of cord was complete at autopsy (Dura not opened at operation).

3. Hemothorax, left moderate atelectasis, bilateral hemoperitoneum—1200 cubic centimeters of fresh blood from punctured right diaphragmatic artery during 1st thoracentesis—evidently the precipitating cause of death. Laminectomy was done at the 5th thoracic vertebra. Massive hematomyelia of cord was found at autopsy.

4. Brain abscess, left frontal secondary to postoperative acute pansinusitis. Death occurred despite decompression of abscess and sinuses. Laminectomy was done at the 1st thoracic vertebra.

It is apropos to mention here that since spinal lesions may make pathology in anesthetic work of the body unusual care must be exercised in searching for such conditions as thrombophlebitis in the legs, intra-abdominal hemorrhage, etc.

For purposes of comparison all patients having gunshot wounds of the spine admitted to this hospital during the years 1941-1944 have been summarized that is the patients who would have had laminectomy had their condition permitted or warranted and the 35 patients just reported who did have laminectomy.

This summary indicates that of the total of 7 patients nearly two thirds could be given the benefit of a laminectomy. 4 patients or 44 per cent had major associated wound, meningitis occurred in 5 patients not operated upon having dural penetration (and of these proved fatal) while only 1 transient case occurred in the group operated upon. Fifty-seven per cent of the patients operated upon showed marked neurological improvement after laminectomy, again 44 per cent postoperative improvement in the series not operated upon.

It is also apparent that the incidence of meningitis is highest in the patients having

lumbar spine wound. Finally, though the operative group is obviously a selected one, the best all-around results are apparent in it.

SUMMARY

1. All patients with spinal wounds who were admitted to an active Army Evacuation Hospital during the years 1943-1944 due to gunshot wound (battle casualties) and having evidence of involvement of the spinal cord or root are reported.

2. Of a total of 57 patients, 35, or 61.4 per cent, were subjected to laminectomy. As to mortality rate, neurological improvement, and low incidence of meningitis, this group

had by far the better record as compared with the group not operated upon.

3. The following concepts are discussed: (a) advisability of laminectomy whenever indicated; (b) indications for laminectomy (for relief of pain, for dural closure, for decompression of cord or cauda); (c) advisability of delaying laminectomy in the presence of a associated chest wound; and of early laminectomy in cauda equina lesions.

4. A plantar vermicular reflex is described that may prove of value in estimating the extent of cord lesion.

5. Spinal cord concussion, contusion, and other injuries are discussed.

Factors Contributing to Its Progress

IRFITT M CARLTON Jr MD and W F ADAMS MD FACS Ch c go Ill no s

This study is based on experience with 59 patients observed mainly during the past 5 years and consists of 45 operations on 36 patients for primary bronchiectasis, 9 cases of bronchiectasis secondary to bronchial tumors and tuberculosis, 7 cases of infected cystic disease of the lung and 7 cases of chronic non specific pulmonary suppuration.

Patients with chronic infection of the lung should be hospitalized for a minimum of 3 or 4 days for observation and laboratory examinations before operation. Our patients receive the routine laboratory study viz blood urine vital capacity putum culture and examination for acid fast bacilli. If anemia and hypoproteinemia are present they are corrected by transfusions of whole blood. Stereoscopic roentgenograms of the chest are made before and after bronchography. Bronchography is usually by the a piratory method is carried out under

OPERATION

The patients are placed in the Trendelenburg position of 20 to 30 degrees with the operative site upward. This facilitates drainage by gravity of mucus into the face mask during surgery. When this is accomplished very little difficulty due to respiratory obstruction has been encountered. Bliss and Graham (3) have suggested that in bilateral bronchiectasis the patients be placed

in a semisitting position while the first stage is being performed. The secretions from the lung tissue being removed would then gravitate into the dependent infected lobe of the opposite side instead of into the trachea and thus minimize the danger of suffocation during the operation. We have not found the use of intratracheal anesthesia to be of any real advantage in removing bronchial secretions and thus have avoided the occasional operative and postoperative complications reported with that method.

Operative technique. Adequate exposure is essential and for lower lobectomy is usually obtained by the resection of a long segment of the 5th rib. For pneumonectomy or upper lobectomy, resection of the 5th or 6th rib is preferable. The phrenic nerve is then crushed. This decreases the motion of the diaphragm, facilitates the technical procedures, and aids in the rapid obliteration of the remaining space following resection. Whereas in the earlier part of our experience the tourniquet technique and closure of the bronchial stump with mattress sutures was employed during the past years the dissection technique with individual ligation of vessels as worked out and described by Blades and Kent (4) has been the procedure of choice in the majority of cases. This technique is now used even in cases in which the fissure is incomplete or in which marked infiltration about the hilum is present. This has been one of the major factors in the reduction of complications and morbidity of lung resection for suppurative disease. In the dissection technique the vessels are mobilized and doubly ligated with linen. If they are of a large caliber and short the distal ligature is a transection suture. Before division of the bronchus laparotomy pads are placed about this region to minimize contamination. Closure of the bronchial stump formerly was accomplished by two rows of sutures the proximal one being mattress in type. More recently closure has been made with a single row of double No. 0 chromic catgut sutures and far fewer postoperative empyema or bronchial fistulas have resulted. Prior to the placing of suture the bronchial secretion are removed with a dry swab following which the mucoosa is de-

stroyed by cauterization with a 1 per cent solution of silver nitrate. Since this technique has been employed no bronchopleural fistulas and only empyemas have occurred in operations including 4 bilobectomy and 1 pneumonectomy. When the dissection technique is used care must be exercised in ligating the artery and closing the bronchus for the blood supply and air passage to the adjacent remaining lung may easily be impaired as pointed out by Blades and Kent (4) and Churchill (5).

After the bronchial stump is closed 10 grams of sulfathiazole is sprinkled about the bronchial stump and pleural cavity. No. 6 Jezzar catheter is brought out through a stab wound in an intercostal space posteriorly for continuous suction drainage of the pleural cavity. (In pneumonectomy sulfonamides are not used locally and the pleural cavity is not drained.) All areas of atelectasis in the remaining lung tissue are regenerated by slightly increasing the positive pressure and massaging the lung. The chest wall is then closed with two paricostal sutures of a double strand of chromic catgut. The intercostal structures are approximated with chromic No. 00 catgut. We have not observed persistent severe pain following the use of paricostal suture as have some authors. The pleural space is aspirated by means of a pneumothorax apparatus until a negative pressure of approximately 5 to 10 centimeters of water is obtained. We feel that the re-expansion of the lung in this fashion is less apt to produce postoperative pneumonia and interstitial emphysema than if inflated by the use of high intratracheal pressure.

Immediately following surgery the patients are bronchoscoped if there is a question of accumulation of secretions in the tracheobronchial tree.

Replacement of the apy. There is no doubt that fluid and blood replacement therapy plays a major role in the lowered morbidity and mortality associated with lung resection. White and Burton (18) have shown that 1,000 to 2,000 cubic centimeters of blood is lost during a lobectomy and an average 1,000 cubic centimeters during a pneumec-

tomy. Therefore our patients undergoing lobectomy and pneumonectomy received 1000 to 1,500 cubic centimeters of whole blood during surgery. In this way anemia hypoproteinemia and shock are obviated. It is much more desirable to prevent shock than to wait for its occurrence before treatment is instituted. Infections complicating the operation should be less frequent if a normal state of the blood including plasma protein level is maintained. (6) Wound healing is also favored. (17)

POSTOPERATIVE CARE

The four most important factors in the postoperative care are (1) avoidance of anoxia (2) maintenance of a clear bronchial tree (3) early expansion of the remaining lung on the operative side and (4) control of infection.

Anoxia. Oropharyngeal insufflation of oxygen is started immediately after surgery and is continued for at least the first 4 hours. It is known that after pulmonary resection there is often a mild degree of anoxemia that may last for several days even in the absence of serious postoperative complications. Maier and Courmand (13) have shown that there may be a more prolonged and severe degree of anoxia after uncomplicated lobectomy than after pneumonectomy. They explain this by the fact that the remaining lung on the side operated upon aerates poorly immediately following surgery while the circulation is not reduced in proportion. Thus the difference between circulation and aeration accounts for inadequate oxygenation of the blood leaving the remaining lung tissue on the side of operation. Maintenance of a normal status of the blood by replacement of blood loss during surgery is of primary importance in the prevention of anoxia.

Secretions. It is imperative that the tracheobronchial tree be as free as possible of secretion before the patient is extubated. If it is an open pneumothorax, as in a hemothorax, patients are bronchoscopic if flowing up, or if there is any question of increased bronchial secretions. As soon as consciousness is regained the head of the bed is elevated 4 to

75 degrees and the patient is urged to cough and move about in bed in order to clear the air passages. Catheter suction of the nasopharynx and trachea is employed at the slightest indication of secretions in the tracheobronchial tree. This not only removes secretions readily but stimulates a more effective cough for clearing the air passages. If the tracheobronchial secretions are removed thoroughly following surgery the tendency for further secretions to develop is decreased. If cough or catheter suction is insufficient to remove the secretions the patient should be bronchoscoped immediately.

Expansion of the lung. By means of constant pleural suction (1) and maintenance of a clear tracheobronchial tree we strive to overexpand the remaining lung tissue and completely obliterate the pleural space as rapidly as possible. This usually requires 12 to 48 hours. Early overexpansion of the remaining lung and obliteration of the space reduces the incidence of serious pleural infections and postoperative morbidity. If expansion of the remaining lung tissue fails an empyema may be expected. The drainage catheter should be large enough to remove the pleural fluid and air as the remaining lung tissue fills the hemithorax. If loculation of the pleural fluid occurs thoracotomy is immediately performed. A fluoroscopic examination is made within the first 1 to 4 hours to evaluate the status of the chest and is repeated frequently thereafter during the entire period of hospitalization.

Infection. The prevention and control of infection have been major problems. However, due to the many advances in improved therapy of the bronchus early expansion of the lung, maintenance of a clear tracheobronchial tree and the use of chemotherapy (ulframids or penicillin) the incidence of serious infections has been greatly reduced. All patients now receive sulfa drugs or penicillin before and following operation. They have also been used in the pleural cavity. There is little doubt but that the use of these drugs is of definite value when combined with improved operative procedures.

Due to the lack of an adequate supply of penicillin for civilian usage this agent has

TABLE I—TREATMENT AND RESULTS IN 36 PATIENTS WITH PRIMARY BRONCHIECTASIS IN WHOM 4 OPERATIONS WERE MADE

Operation		Sex		P th		Co		Joints		Res Ls		Deaths		Remarks	
Class	Sex	M	F	U	R	A	P	F	F	Good	Fair	Long	I		I
A. Dissection and removal of diseased tissue															
II	Female													Bilateral case—died year after operation	
B. Tourniquet															
II	Female													Perforated stomach	
C. Subtotal lobectomy															
II	Female													Transverse colon perforated	
D. Subtotal lobectomy and removal of diseased tissue															
II	Female													Transverse colon perforated	
Total															
Percentage of results: 100% good, 100% fair, 100% long, 100% by, 100% deaths															

been employed in only a few patients. Our experience as well as that of others (14, 19) suggests that penicillin may be of even more value than the sulfonamides in the prevention of complications.

In order for the patient to have the best resistance against infection a good general condition must be maintained. Repeated blood and urine examinations, plasma protein determinations and blood sulfonamide level are made to insure the best possible management.

PRIMARY BRONCHIECTASIS

The treatment of bronchiectasis is remained a difficult problem for the surgeon until the present decade but recent results indicate the marked progress which has been made.

In 1933 Graham (8) reviewed the literature and found that in 48 cases of lobectomy for bronchiectasis there had been an operative mortality of 5 per cent. Because of the hazard of lobectomy he devised an operation which he termed cauterized pneumonectomy and in 1934 reported 20 cases with an operative mortality of 5 per cent. (9) The modern operation of lobectomy for bronchiectasis was first made by Brunn in 1900 who reported 6 operations with 4 cures and

unimproved and 1 death. Shenstone and Janes of Toronto improved on the method of Brunn by use of the tourniquet. Since 1919 almost incredible results have been obtained. Statistics from leading clinics in the United States and England reveal that the average mortality for lobectomy in bronchiectasis is now only about 5 per cent. (10) As has been pointed out there are a number of factors that have been responsible for the lowered mortality.

Table I shows the treatment and results in 36 patients with primary bronchiectasis in whom 43 operations were made. Of this group 10 had bilateral involvement. The patients ranged in age from 14 to 54 years. The cases have been divided into two groups depending on the type of resection employed: viz. (A) dissection technique and (B) tourniquet technique. Each group has been further subdivided into three parts: (1) patients in whom roentgen studies were used; (2) patients in whom sulfonamides were used systemically; and (3) patients in whom ulcers of the stomach were treated systemically.

If rare and locally
 10 patients
 Group I C

TABLE II—RESULTS FOLLOWING LOBECTOMY OR INFURNECTOMY IN SEVEN PATIENTS WITH CHRONIC NONFISTULOUS PULMONARY SUPURATION

Case	P	Lobes	O ₂		S H nam		Complica				Results	Remark
			D	Too	m	Ex. I	A I	Fmp	F	P m		
	A. R.	LL		+	+	—					E	
	F. S.	R. I.		+	+	—					F	
3	H. I.	LL		+	—	—		+			F	
	F. G.	RL	+		+	+					E	
5	Wm. D.	LL	+		+	+					F	1 f on d f l b f l
	A. C.	RU & L	+		+	P. II					E	Pneumococ my h
6	G. H.	RL	+		+	+					F	P. II (I. M.)

In A I dissection ectric amp Tou m m f ex h u al P m m

1 male Bilateral pathology was present in one of the patients. This group received sulfonamides systemically and developed no postoperative complications following surgery. The results in this group of 3 patients were excellent. The second group consisted of 7 patients 4 female and 3 male with bilateral pathology in 2 cases. Of the 7 patients 2 developed an empyema following operation (no fistula) which healed following open drainage. The results were excellent in all 7 patients. In 1 of the bilateral cases only one lobe has been treated surgically. One patient died 1 year after operation of pneumonia just before a contemplated 2nd operation for bronchiectasis of the opposite lung.

B. Tourniquet technique. Group I Sixteen operations were performed on 11 females and 5 males the tourniquet technique being used but no sulfonamides. In this group 11 of the 16 patients had bilateral disease. The postoperative complications were more frequent in this group than in any of the other groups. Postoperative atelectasis occurred in 3 patients, an encapsulated empyema developed in 12 5 of whom demonstrated a bronchial fistula and 3 patients had pneumonia. Of the group of 16 patients 8 had excellent results, 5 good, 1 fair, 1 poor and there was 1 death. A patient with bilateral involvement died 3 days following operation of pneumonia (1941). There have been fatal deaths due to the disease in this group. One

was a patient with bilateral disease who died of pneumonia over 3 months after surgery. The other patient died of acute nephritis and pneumonia over 1 year after surgery.

Group II Fifteen operations were made on 8 female and 7 male patients the tourniquet technique being used with sulfonamides administered systemically. Bilateral bronchiectasis was present in 11 of the 15 patients. Empyema as a complication was present in 10 patients with 8 having an associated bronchial fistula. One patient developed pneumonia. The results were excellent in 6 patients, good in 4 and fair in 4. There was 1 early death and 1 late death and more surgery is still contemplated in 3. The early death was in a patient with bilateral involvement who developed an empyema, bronchial fistula and progressive infection of the chest wall which eventually led to a transverse myelitis 6 weeks following surgery. The late death was in a patient with unilateral involvement and was due to a complication of the disease namely metastasis to the brain 1½ years after an operation on the more involved side.

Group III The third group consisted of 4 bilateral cases 2 males and 2 females. In these patients the tourniquet technique was used and sulfonamides were given both locally and systemically. There were no postoperative complications and the results were excellent in all 4 patients. These operations were all made within the past 2 years.

TABLE III—RESULTS FOLLOWING LUNG RESECTION IN 7 PATIENTS WITH CYSTIC DISEASE OF THE LUNG (INFECTED)

Case	P	P h Lobe	Operation		Self Therapy		Complications				Result	Remarks
			I	Tou	vs m	Loc I	A I	Em	I	Pneu		
	J C	LL		+	+			+			E	
	L F	LL LL	+		+					+	F	
3	I F	R I	+		+						E	
	P R	R I RL		+	+	+		+	+		F	I pl al
	P C	R I	+		+						E	
	D O	LL	+		+	+					F	F l l l uscu
	L A	RL	+		+	+					E	F m l l l

TABLE IV—RESULTS FOLLOWING LUNG RESECTION IN 6 PATIENTS WITH BRONCHIECTASIS SECONDARY TO PULMONARY TUBERCULOSIS

	E H	R I & RL		+			+	+		U	F m al	vs lobe	Loc
	I S	RL		+	+		+					d be for	R I RL lobes
	S B	LL		+	+			+					
	A I	LL		+									
5	M B	LL		+	+								
	L E	RL	+		+								

TABLE V—RESULTS FOLLOWING LUNG RESECTION FOR BRONCHIECTASIS SECONDARY TO BRONCHIAL TUMOR (3)

	G I	RL	+		+		+			D I	R og	h	an
	W W	RL		+									
	R T	R I & RL	+		+					E			

Dissection and penicillin T. tourm. A. I. Results E. m. mpy. F. l. l. P. ne m.

CHRONIC DIFFUSE PNEUMONITIS

Table II shows the treatment and results obtained in patients with chronic diffuse penicillin pulmonary suppuration. In the patients the pathology was located in a lower lobe in 5 instances. In all these patients the pathological picture was that of a diffuse pneumonitis without cavity formation. In 6 of the 7 patients sulfonamids were administered systematically and in 4 of the 7, the operation was performed by the direct incision technique. The patient receiving no chemotherapy developed the only complication in the entire group, it being an empyema (without a bronchial fistula) that healed

radially after pen drainage. In the only pneumonitis in this series penicillin was placed in the pleural cavity. Complete relief of symptoms was obtained in all patients.

INFECTED LUNG CYST

Table III shows the treatment and results obtained in 7 patients with infected cyst of the lung. In 1 patient the direct incision technique was used and in 6 postoperative complications developed. The results were excellent. In the 1 patient in whom the technique was used both patients had postoperative empyema and one had a bronchial fistula. The fistula, however,

were satisfactory in both patients. Sulfonamides were administered systemically to all of these individuals. Two also received penicillin systemically and one locally.

BRONCHIECTASIS SECONDARY TO TUBERCULOSIS

Table IV illustrates the treatment and end results in 6 patients with bronchiectasis secondary to pulmonary tuberculosis. The pathological lesion was in the left lower lobe in 3, the right lower lobe in 3 and in 1 of the latter also in the right middle lobe. In 5 of the 6 patients the tourniquet technique was employed and 4 patients received sulfonamides systemically. Patient L. H. had an empyema with fistula following surgery. Her condition was unimproved due to the persistent tuberculosis in the right upper lobe. Patient M. S. developed atelectasis in a tuberculous right upper lobe following surgery. She continued to have tuberculosis of the right middle and right upper lobes but at present her condition is improved. Patient S. B. developed an empyema but the final results were satisfactory. Patient A. M. developed a fistula following surgery which healed several months later. She has been asymptomatic for 3 years. The remaining 2 patients had no complications following surgery and were relieved of their symptoms.

BRONCHIECTASIS SECONDARY TO TUMOR

Table V presents the treatment and end results in 3 patients with bronchiectasis secondary to bronchial tumor. In patient G. M. the right lower lobe was involved. This was removed by the dissection technique and she received sulfonamides systemically. She developed an infarct and an empyema and died 1 day following operation due to retrograde thrombosis and pneumonia. Patient W. W. had the right lower lobe removed by the tourniquet technique. No sulfonamides were given there were no complications and the patient has been completely relieved of symptoms. Patient R. T. had the right middle and right lower lobes removed by the dissection technique. Sulfonamides were given systemically. There were no complications and the final result was excellent.

DISCUSSION

The morbidity and mortality associated with the surgical treatment of bronchiectasis may be influenced by a number of factors (3, 4). In addition to those already discussed, the age of the patient, duration, distribution and severity of the disease markedly influence the course and results of surgical treatment. In the series of 36 patients studied (45 operations) 9 had bilateral involvement and as pointed out by Blades and others the surgical risk is considerably greater than when the lesion is limited to one side. There were two operative deaths and both followed the first operation for bilateral involvement. Eight of the 20 bilateral group have had both operations completed the course following the second operation being less difficult than after the first. This is partly due to the marked improvement that usually follows the first operation thus making them better surgical risks and also because little or no diseased lung remains after the second operation.

The total amount of lung tissue that may be safely removed has been investigated by Heuer and Andrus (11) and others as well as by ourselves (12). Dogs have been observed for several years following the reduction of lung function to a single upper lobe (13 per cent) and when at rest appear entirely normal. When placed in a pressure chamber under reduced atmospheric pressure the respiratory reserve compares surprisingly well with that of normal animals.

Clinical experience shows that human beings may also tolerate the removal of a large percentage of the total lung capacity. Calam (10) in 1930 reported the successful removal of both lower lobes, the right middle lobe and the lingula of the left upper lobe without the production of dyspnea or other physical handicap. In 2 of our 5 completed bilateral operations the same amount of lung resection was made. Both patients returned to full time work following surgery.

When bilateral operations are contemplated sufficient time following the first operation for complete recovery and obtaining its beneficial effects should be allowed. The interval between operations may vary from

6 to 12 months or more depending on the occurrence of complications and the severity of the case. In one of our 8 cases the second operation was attempted 3 months following the first and because of the slow return of diaphragmatic function following the first stage had to be abandoned. It was performed 3 months later without difficulty. In

other cases death occurred (pneumonia meningitis) just before the second operation had been planned. This had been 1 year and 12 years respectively following the first operation.

In evaluating various factors contributing to the progress of surgical therapy care must be exercised in order not to form erroneous conclusions. Statistics are often misleading even to those who are most acquainted with the facts.

In Table I Group B I and II the 1 operations were on poor risk patient made 3 to 5 years ago when the operative technique in addition to mattress sutures entailed the use of a ligature placed about the hilum of the lung as the tourniquet was being removed. This may partly explain the high incidence of empyema and bronchial fistula in both groups in spite of the fact that sulfonamides were used in Group B II. In Group B III this ligature was not used and no complications resulted.

Groups A I and II are too small for comparison however when the patient presented in Tables II III IV and V are included the results are quite convincing namely that the local and systemic use of sulfonamides in combination with the dissection technique is the procedure of choice in lobectomy for pulmonary suppuration. In patients treated in this manner there were no bronchial fistulas and only 3 empyemas. As stated earlier penicillin may replace the sulfonamides as the chemotherapeutic agent of choice.

In pneumonectomy the pleural cavity is not drained following operation. The local sulfonamide therapy is less desirable because of the ill effects of rapid accumulation of fluid in the pleural cavity and collapse of the remaining lung. Penicillin however if deposited in the pleural cavity may remain in

effective concentration for 1 to 4 hours and without the production of an undue amount of pleural fluid.

SUMMARY AND CONCLUSIONS

The result of lung resection in 59 cases of pulmonary suppurative diseases are presented and the various factors contributing to its progress are discussed. Chief among these were rapid complete expansion of the remaining lung, replacement of blood loss, avoidance of anoxia and prevention of serious infection following operation. The dissection technique of resection is the procedure of choice in most cases. Chemotherapy has been a major factor in the prevention of serious postoperative infection. There were 2 deaths in 45 operation made on 36 patients with bronchiectasis 6 of which were bilateral.

NOTE: See this manuscript with reference to the following: 1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100. 101. 102. 103. 104. 105. 106. 107. 108. 109. 110. 111. 112. 113. 114. 115. 116. 117. 118. 119. 120. 121. 122. 123. 124. 125. 126. 127. 128. 129. 130. 131. 132. 133. 134. 135. 136. 137. 138. 139. 140. 141. 142. 143. 144. 145. 146. 147. 148. 149. 150. 151. 152. 153. 154. 155. 156. 157. 158. 159. 160. 161. 162. 163. 164. 165. 166. 167. 168. 169. 170. 171. 172. 173. 174. 175. 176. 177. 178. 179. 180. 181. 182. 183. 184. 185. 186. 187. 188. 189. 190. 191. 192. 193. 194. 195. 196. 197. 198. 199. 200. 201. 202. 203. 204. 205. 206. 207. 208. 209. 210. 211. 212. 213. 214. 215. 216. 217. 218. 219. 220. 221. 222. 223. 224. 225. 226. 227. 228. 229. 230. 231. 232. 233. 234. 235. 236. 237. 238. 239. 240. 241. 242. 243. 244. 245. 246. 247. 248. 249. 250. 251. 252. 253. 254. 255. 256. 257. 258. 259. 260. 261. 262. 263. 264. 265. 266. 267. 268. 269. 270. 271. 272. 273. 274. 275. 276. 277. 278. 279. 280. 281. 282. 283. 284. 285. 286. 287. 288. 289. 290. 291. 292. 293. 294. 295. 296. 297. 298. 299. 300. 301. 302. 303. 304. 305. 306. 307. 308. 309. 310. 311. 312. 313. 314. 315. 316. 317. 318. 319. 320. 321. 322. 323. 324. 325. 326. 327. 328. 329. 330. 331. 332. 333. 334. 335. 336. 337. 338. 339. 340. 341. 342. 343. 344. 345. 346. 347. 348. 349. 350. 351. 352. 353. 354. 355. 356. 357. 358. 359. 360. 361. 362. 363. 364. 365. 366. 367. 368. 369. 370. 371. 372. 373. 374. 375. 376. 377. 378. 379. 380. 381. 382. 383. 384. 385. 386. 387. 388. 389. 390. 391. 392. 393. 394. 395. 396. 397. 398. 399. 400. 401. 402. 403. 404. 405. 406. 407. 408. 409. 410. 411. 412. 413. 414. 415. 416. 417. 418. 419. 420. 421. 422. 423. 424. 425. 426. 427. 428. 429. 430. 431. 432. 433. 434. 435. 436. 437. 438. 439. 440. 441. 442. 443. 444. 445. 446. 447. 448. 449. 450. 451. 452. 453. 454. 455. 456. 457. 458. 459. 460. 461. 462. 463. 464. 465. 466. 467. 468. 469. 470. 471. 472. 473. 474. 475. 476. 477. 478. 479. 480. 481. 482. 483. 484. 485. 486. 487. 488. 489. 490. 491. 492. 493. 494. 495. 496. 497. 498. 499. 500. 501. 502. 503. 504. 505. 506. 507. 508. 509. 510. 511. 512. 513. 514. 515. 516. 517. 518. 519. 520. 521. 522. 523. 524. 525. 526. 527. 528. 529. 530. 531. 532. 533. 534. 535. 536. 537. 538. 539. 540. 541. 542. 543. 544. 545. 546. 547. 548. 549. 550. 551. 552. 553. 554. 555. 556. 557. 558. 559. 560. 561. 562. 563. 564. 565. 566. 567. 568. 569. 570. 571. 572. 573. 574. 575. 576. 577. 578. 579. 580. 581. 582. 583. 584. 585. 586. 587. 588. 589. 590. 591. 592. 593. 594. 595. 596. 597. 598. 599. 600. 601. 602. 603. 604. 605. 606. 607. 608. 609. 610. 611. 612. 613. 614. 615. 616. 617. 618. 619. 620. 621. 622. 623. 624. 625. 626. 627. 628. 629. 630. 631. 632. 633. 634. 635. 636. 637. 638. 639. 640. 641. 642. 643. 644. 645. 646. 647. 648. 649. 650. 651. 652. 653. 654. 655. 656. 657. 658. 659. 660. 661. 662. 663. 664. 665. 666. 667. 668. 669. 670. 671. 672. 673. 674. 675. 676. 677. 678. 679. 680. 681. 682. 683. 684. 685. 686. 687. 688. 689. 690. 691. 692. 693. 694. 695. 696. 697. 698. 699. 700. 701. 702. 703. 704. 705. 706. 707. 708. 709. 710. 711. 712. 713. 714. 715. 716. 717. 718. 719. 720. 721. 722. 723. 724. 725. 726. 727. 728. 729. 730. 731. 732. 733. 734. 735. 736. 737. 738. 739. 740. 741. 742. 743. 744. 745. 746. 747. 748. 749. 750. 751. 752. 753. 754. 755. 756. 757. 758. 759. 760. 761. 762. 763. 764. 765. 766. 767. 768. 769. 770. 771. 772. 773. 774. 775. 776. 777. 778. 779. 780. 781. 782. 783. 784. 785. 786. 787. 788. 789. 790. 791. 792. 793. 794. 795. 796. 797. 798. 799. 800. 801. 802. 803. 804. 805. 806. 807. 808. 809. 810. 811. 812. 813. 814. 815. 816. 817. 818. 819. 820. 821. 822. 823. 824. 825. 826. 827. 828. 829. 830. 831. 832. 833. 834. 835. 836. 837. 838. 839. 840. 841. 842. 843. 844. 845. 846. 847. 848. 849. 850. 851. 852. 853. 854. 855. 856. 857. 858. 859. 860. 861. 862. 863. 864. 865. 866. 867. 868. 869. 870. 871. 872. 873. 874. 875. 876. 877. 878. 879. 880. 881. 882. 883. 884. 885. 886. 887. 888. 889. 890. 891. 892. 893. 894. 895. 896. 897. 898. 899. 900. 901. 902. 903. 904. 905. 906. 907. 908. 909. 910. 911. 912. 913. 914. 915. 916. 917. 918. 919. 920. 921. 922. 923. 924. 925. 926. 927. 928. 929. 930. 931. 932. 933. 934. 935. 936. 937. 938. 939. 940. 941. 942. 943. 944. 945. 946. 947. 948. 949. 950. 951. 952. 953. 954. 955. 956. 957. 958. 959. 960. 961. 962. 963. 964. 965. 966. 967. 968. 969. 970. 971. 972. 973. 974. 975. 976. 977. 978. 979. 980. 981. 982. 983. 984. 985. 986. 987. 988. 989. 990. 991. 992. 993. 994. 995. 996. 997. 998. 999. 1000.

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GRANULOSA CELL TUMOR OF THE OVARY

A Clinical and Pathologic Review of Sixty Two Cases

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FIVE recent developments may be listed as representing advances in our general knowledge of the origin, life cycle and physiologic side effects of granulosa cell tumor of the ovary.

1 The experimental production in mice of the neoplasm by means of roentgen rays (11, 12, 15, 38) has resulted in histogenetic studies tending to support the thesis of Fischel, namely that granulosa cell tumor and theca cell tumor are derivatives of the ovarian mesenchyma. Corroborative evidence is afforded by human material in which a mixture of granulosa cell and theca cell elements take place within the same neoplasm (4, 18, 25, 39).

Granulosa cell tumors, however, one may be inclined to regard them histologically, at times have proved to be clinically malignant, to recur and also to metastasize (6, 14, 4, 29, 30). Moreover the tumors that had metastasized had histologic pictures identical with those of so-called benign tumors. Because of this observation a radical operative procedure usually is performed especially when the case is that of a young postmenopausal life.

3 Direct proof of the so-called functioning capacity of granulosa cell tumor has accumulated with additional reports dealing with bioassays of tumor tissue for estrogenic hormone (13, 31). This hormone frequently has been found to be present in excessive amounts. Moreover similar methods using blood and urine and the material for examination have demonstrated measurable quantities of circulating hormone the level of

which drops precipitously within 48 hours of the time the tumor is removed. Quantitative chemical analysis for lipid content of tumor tissue has demonstrated high values for cholesterol and cholesterol esters, the building stones of the estrogen molecule. The postmenopausal bleeding so commonly noted as a symptom of granulosa cell tumor and the occurrence of amenorrhea in young women are clinical evidence for a condition of hyperestrinism.

4 The luteinization of granulosa cell tumor first described by Lecne in 1910 and noted by several other clinical investigators (2, 6, 17, 7) also has been observed in the tumors produced experimentally in animals. Whether the hormone progesterone also is secreted during what might be termed the ripening phase of granulosa cell tumor is a matter for future study. The simultaneous finding in a patient of a progestational endometrial picture and luteinized granulosa cell tumor would lend positive support to the progesterone thesis. Several of our cases presented this interesting combination of conditions.

5 The coexistence of granulosa cell tumor and endometrial adenocarcinoma has been noted by several investigators (6, 35). Similarly mammary carcinoma has been observed to develop before or after the removal of a granulosa cell type of ovarian tumor (9). The association of these two lesions to say nothing of the concomitant incidence of uterine leiomyoma in more than 50 per cent of cases has led many physicians to the belief that prolonged hormonal stimulation of the breast and uterus has in fact been responsible for neoplasia in these organs. The administration of estrogenic substance to certain of the lower animals has this result (10, 24).

A document of these subjects is the following:
Faculty of the University of Minnesota School of Medicine, 1931
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PURPOSE OF STUDY MATERIAL AND METHOD

Purpose In 1939 one of us (Dockerty 6) collaborated in reviewing the pertinent clinical and pathologic data in the record of 33 cases of granulosa cell tumor from the files of the Mayo Clinic. Since a further study of approximately 3,500 miscellaneous ovarian tumors revealed some cases that had been overlooked in preparing the 1939 report as well as some subsequent case re-examination of this subject seemed to be worth while especially in view of what we have learned in the last half decade concerning this type of ovarian tumor.

Material The material which forms the basis for this report consists of 6 cases of granulosa cell tumor encountered at the Mayo Clinic between 1910 and 1944. As previously mentioned 33 of these cases were reported in 1939. The tumors had been removed surgically or had been encountered at necropsy. In 44 cases the uterus with its endometrium was available for study and in one additional case simple curettement provided material for a study of the endometrium. All the specimens had been preserved in formaldehyde.

Method Gross pathologic studies of the tumors first were carried out with particular attention to location, size, color, consistency, degree of encapsulation and fourth. The contralateral ovary was studied for the presence of mature or developing follicles and corpus luteum. The uterus were inspected for enlargement and fibromyoma. The thickness and character of the endometrium were noted. A careful search was made for polyp and small carcinomatous remnant which previously might have escaped detection.

Multiple blocks of tissue then were cut from the tumor, the contralateral ovary, the uterus and the endometrium and these were placed in a fresh 10 per cent solution of formalin (1 per cent formaldehyde). Numerous section next were cut on a freezing microtome and stained with hematoxylin and eosin and fast green FCF which blocks were to be treated by special method. The blocks subsequently were stained routinely with hematoxylin and eosin. Gomori stain for reticulum and van Gieson

stain for lipid. Section stained with hematoxylin and eosin were considered satisfactory for a study of the uninvolved ovaries and the blocks of myometrium and endometrium. Both the freezing and the paraffin method were employed in all instances. Larger blocks of tissue were removed from four tumors for determination of lipid. These blocks were taken from one luteinized and three nonluteinized tumors for purpose of comparison.

By way of further comparison portions of seven normal ovaries were analyzed in a similar manner after care had been taken to avoid including such structures as developing or mature corpus luteum whose high content of lipid might nullify comparative results. The lipid content was determined from an alcohol-ether extract. For the estimation of cholesterol and cholesterol esters the method of Bloor and Knudsen was employed. The determinations of phospholipid were made according to the method of Youngburg and Youngburg.

CLINICAL DATA

Incidence Sixty-two (63 per cent) of the 3,500 ovarian tumors encountered at the Mayo Clinic between 1910 and 1944 were of the granulosa cell type. Szathmari found an incidence of 0.9 per cent in a similar large series. Schröder believed 3 per cent of all ovarian neoplasms were of the granulosa cell type.

Age The age of patients in the 6 cases ranged from 18 months to 65 years, the average age being 38 years. The first and second and third decades each accounted for 1 case. The fourth decade accounted for 6. In the fifth and sixth decades were listed 1 and 1 and 1 patient respectively. Four patients came within 10 years of age (one tumor 6 per cent) occurred during the first decade and 3 patients during the second decade. The first 8 (6 per cent) could be classified as premenopausal patients.

Marriage Fifty-five of the 66 patients were married and 18 were single. Of the married patients 21 per cent were multiparous. This incidence of infertile

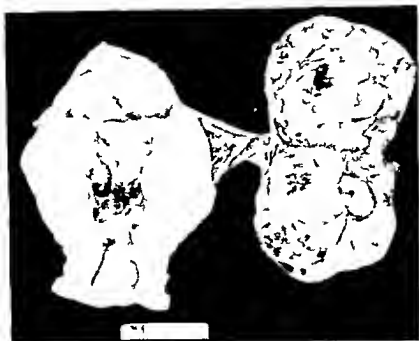


Fig. 1. Two granulosa cell tumors of the ovary, 11 months after the first hysterectomy. The tumors are 1.5 cm in diameter and 1.5 cm in length. The patient is a 35-year-old female.

tivity is somewhat higher than in an average group of married women. After surgical removal of the granulosa cell tumor 3 of the 12 patients became pregnant. Of the 42 women who had had children 15 were multiparas and 7 were primiparas; the total number of children was 108. Thus it would seem that parity of the women might have been influenced. Conversely, however, it appears that parity has no influence on the development of a granulosa cell tumor.

Previous operative procedures. Operations had been carried out 14 times in 18 cases. In 7 cases unilateral oophorectomy had been performed for some type of ovarian neoplasm; the exact nature of which could not be determined from the record, and the diagnosis of recurrent granulosa cell tumor was not considered until the ultimate outcome indicated such a likelihood. In 8 cases uterine curettage had been performed at intervals ranging from months to 7 years previously. Two patients had undergone hysterectomy, one for uterine fibroid and the other for menorrhagia. The eighteenth

patient had had bilateral radical mastectomy for carcinoma carried out 6 years and 13 weeks respectively prior to registration.

SYMPTOMS

Uterine bleeding. This symptom was present in 46 of the 66 cases (74 per cent) and represented the most common complaint.

In the one case in which the patient was of prepubertal age, periodic vaginal bleeding had occurred at the age of 17 months.

Of the 3 patients who were considered to be in the reproductive period, 13 suffered from menometrorrhagia of varying duration. Perhaps of more interest was the fact that in 10 of these 13 cases the bleeding had been preceded by episodes of amenorrhea lasting from 1 to 7 years. Szathmari¹⁰ also noted that in 45 per cent of sexually mature patients the granulosa cell tumor apparently had caused an initial period of amenorrhea. One patient of menarcheal age complained only of light menorrhagia.

In the group of 38 patients who had passed the menopause, bleeding was present in all



Fig. 1. Left: Endometrial section showing grossly inflamed endometrium. Right: Endometrial section showing grossly inflamed endometrium. (H & E, $\times 57$)

case. The bleeding occasionally tended to simulate menstruation occurring at fairly regular interval ranging from 1 to 3 weeks. The discharge often was described by patients as resembling menstrual flow. It was seldom profuse or of long duration. Three of the 38 patients gave histories of premature menopause; these may represent examples of an initial amenorrhea resulting from the tumor.

One 70-year-old patient had had her last menstrual period at the age of 11 years. More or less regular vaginal bleeding occurred when she was 66. A 6-year-old patient who had had irregular vaginal bleeding for 1 year described a period of amenorrhea between the age of 1 and 40. A 4-year-old patient who had had vaginal bleeding for months had had amenorrhea between the age of 1 and 35. A period of irregular bleeding had ensued but had ceased after administration of a menopausal dose of roentgen therapy at the age of 46. The possible duration of the granulosa cell tumor in these 3 cases—namely, 6 and 1 year—is not inconsistent with the nature of these lesions. In the 1939 report from the literature a case was cited in which the known duration was 1 year.

Amenorrhea. Of the 3 patients of menstrual age 3 (22 per cent) complained of amenorrhea lasting from 1 to 7 years. The amenorrhea was not followed by bleeding as described in the foregoing paragraph. Five of the 23 had normal menstrual histories. A count of all patients who had complained of amenorrhea at some time excluding those whose granulosa cell tumor undoubtedly developed late in life showed that amenorrhea occurred in 18 of 26 patients.

Abdominal enlargement. Fifteen of the 26 patients (58 per cent) complained chiefly of abdominal enlargement or tumor. Two additional patients regarded this symptom as of secondary importance. The duration of the abdominal enlargement ranged from 11 days to 11 years and in the majority of instances its growth was described as slow.

Pain. Although pain was a symptom in 23 cases it was the major complaint of only 3 patients. Rarely severe it was most frequently described as a bearing-down or tight feeling on the side of ovarian involvement.

Miscellaneous. Complaints such as urinary incontinence and dribbling, falling of the womb, and so forth occasionally were



Fig. 3. Left: Cystic degeneration of granulosa cell tumor. Right: High magnification of granulosa cell tumor showing characteristic strap nuclei.

noted. Two patients complained of tenderness in the breasts.

PHYSICAL AND LABORATORY EXAMINATIONS

Physical findings. In 43 of the 6 cases (69 per cent) an adnexal tumor presumably ovarian was present. In 14 cases the presence of a large uterus with or without fibromyomas was suspected. In several cases large leiomyomas made accurate palpation of the adnexal regions impossible. In 3 cases no pathologic lesion of the pelvis was palpated; operation being undertaken mainly because of postmenstrual bleeding. Mammary hypertrophy had not been noted but in one case bilateral radical mastectomy had been performed because of carcinoma.

Laboratory findings. No provocative endocrine studies were performed. In the case of a 7-year-old woman who had a granulosa cell tumor, determinations of urinary estrogen were made during the first 48 hours postoperatively. During the first 24 hours 8 rat units of estrogen were excreted in each liter of urine. None was found during the second determination. The drop in the level of urinary estrogen corresponds with the findings of other investigators.

One fairly consistent laboratory finding was a low value for hemoglobin; the average value being 11 grams per 100 cubic centimeters of blood. Readings as low as 5 grams were obtained in several cases. This observation was consistent with the clinical symptom of uterine bleeding but was not actually specific as an aid in differential diagnosis.

The results of lipid analysis of tumor tissue are recorded in a subsequent paragraph.

PATHOLOGIC DATA

Macoscopic findings. Location. All 6 tumors were unilateral with the right and left ovaries sharing an approximately equal incidence of involvement. None was of extra-ovarian origin (3, 33, 41).

Size. The largest tumor weighed 34 pounds (15.4 kgm) and measured 40 centimeters in its greatest diameter; the smallest measured 4 millimeters in diameter. No apparent correlation existed between the age of the patient, the size of the tumor, or the duration of symptom.

Color and consistency. The color of the tumor ranged from a light cream color to a brownish black; the most common color

size Twenty five per cent of the tumors were grossly edematous Yellowish orange regions suggestive of luteinization were present in about 5 per cent of the tumors (Fig 1)

Encapsulation Although adhesions were present in 13 cases (1 per cent) and often were associated with twisting of the pedicle all tumor except 3 were fairly well encapsulated One of these tumors had extended into the fallopian tube on the same side another had extended into the terminal portion of the ilium and the third had infiltrated the broad ligament Clinical malignancy was correlated with lack of encapsulation

Ascites In 6 cases moderate to large amounts of free fluid were present in the peritoneal cavity In one of these cases fluid also was present in the chest (Klug's syndrome caused by granulosa cell tumor rather than ovarian fibroma) Ascites was not found in association with small tumors and it was our feeling that as with fibromas (8) the presence of free peritoneal fluid was related to obstructed circulation (edema) within the tumor or its pedicle

Associated pathologic lesions Of the many pathologic lesions associated with granulosa cell tumor the high incidence of uterine fibromyoma and of uterine hypertrophy (subinvolution) is noteworthy (Table I) This observation also has been made by other investigators The presence of fibromas and hypertrophy together with the occurrence or reactivation in one case of extensive endometritis with a large fatty cyst in the normal ovary may be viewed as an interesting manifestation of hyperestrinism The simultaneous occurrence in 8 cases (13 per cent) of a so-called adenocarcinoma of the uterine fundus is indeed surprising and cannot be explained adequately on the basis of chance There were 3 cases of mammary carcinoma

Microscopic findings Inasmuch as the microscopic appearance of granulosa cell tumor repeatedly has been described in the literature no attempt at detailed repetition is necessary Follicular cylindrical diffuse and pseudoglandular cell patterns were all represented in our series The follicular

TABLE I—PATHOLOGIC LESIONS ASSOCIATED WITH GRANULOSA CELL TUMOR IN 62 CASES

Pathologic	Cases	Percentage
Uterine fibromyoma	3	51.6
Uterine myohypertrophy (leiomyoma)	37	59.6
Adenomyosis	5	
Endometritis		9.6
Carcinoma of the endometrium	8	9
Cervicitis	3	37
Cervical polyp		1.6
Endometrial polyp		1.7
Tubal ectopic pregnancy (tubo-ovarian)		1.6
Endometrial polyp		1.6
Fibromyoma of the ovary		6
Cystadenoma of the ovary		6
Leiomyoma of the ovary	1	1.6
Bilateral ovarian cysts		7
Mammary carcinoma	3	4.8
Bilateral leiomyoma		
Mammary leiomyoma		

patterns predominated in 15 tumors (24 per cent) the cylindrical with all its variations in 30 tumors (49 per cent) and the sarcomatoid in 17 tumors (27 per cent) The sarcomatoid group which included the 3 cases in which clinical malignancy was evident appeared to be the most active type from the standpoint of cellular division (mitosis)

The pseudoglandular arrangement of cells was found in scattered regions that were predominantly cylindrical in no instance was it the only pattern observed Luteinization of varying degree was evident on gross and microscopic examination in about 5 per cent of tumors The cells in these regions had lost their basophilic staining and had become loaded with lipid substance which stained intensely with sudan III (Fig. a) This luteinization appeared to be reflected in the endometrium in 2 cases in which changes of a secretory nature were present (Fig. b) This is perhaps indirect evidence that the luteinized granulosa cell tumor produces progesterone in addition to estrogen but actual biologic proof of this phenomenon is still lacking

Using Broders' method of grading the tumor was graded 1 in 45 cases (73 per cent) and 2 in 17 cases (27 per cent) Four of the 50 so-called recurrences were of a higher grade of malignancy than was the original lesion

Twelve (19 per cent) of the tumors presented microscopic features of combined

granulosa cell tumor. The fourth patient is alive years after operation for a so-called recurrence in the contralateral ovary. The fifth patient died 19 years after operation. Although we have no actual proof of recurrence her case was so listed because of a history given by her family of recurrent vaginal bleeding prior to death.

From the relatively high incidence of clinical malignancy as evidenced by recurrence of the neoplasm in postmenopausal patients it would seem logical to advise total hysterectomy with bilateral salpingo-oophorectomy for granulosa cell tumor. Among 43 patients of all ages who received this latter type of treatment there were no recurrences. In the literature the recurrence rate for granulosa cell tumor varies from 4.5 per cent (von Fallo 60 cases) to 5 per cent (Novak and Brawer 3 case).

Conservative surgical procedures were carried out in 5 cases in which the patients were less than 4 years of age. There were no recurrences in this group and 3 of the patients subsequently became pregnant. Although this portion of our series is small it is our impression from reading the literature that conservative operation is a safe procedure for young women when the granulosa cell tumor is well encapsulated.

Irradiation. In the experimental animal (mouse) granulosa cell tumors have been produced by the use of roentgen ray. The question might therefore be raised as to what stimulating effect intrauterine radium theoretically might have on the ovaries of women later found to contain granulosa cell tumor. In 6 of our cases radium had been employed in the treatment of postmenopausal bleeding. In several instances cessation of bleeding indicated that the radium did not cause a tumor but had a definite retarding influence on a pre-existing granulosa cell tumor. One of these cases was reported previously by MacCarty and one of us (Dockerty¹¹). The pertinent detail of another case follows.

A 45-year-old woman had a child at age 35. At age 38 she had a second child at age 40. At age 42 she had a third child at age 43. At age 44 she had a fourth child at age 45. At age 46 she had a fifth child at age 47. At age 48 she had a sixth child at age 49. At age 50 she had a seventh child at age 51. At age 52 she had an eighth child at age 53. At age 54 she had a ninth child at age 55. At age 56 she had a tenth child at age 57. At age 58 she had an eleventh child at age 59. At age 60 she had a twelfth child at age 61. At age 62 she had a thirteenth child at age 63. At age 64 she had a fourteenth child at age 65. At age 66 she had a fifteenth child at age 67. At age 68 she had a sixteenth child at age 69. At age 70 she had a seventeenth child at age 71. At age 72 she had an eighteenth child at age 73. At age 74 she had a nineteenth child at age 75. At age 76 she had a twentieth child at age 77. At age 78 she had a twenty-first child at age 79. At age 80 she had a twenty-second child at age 81. At age 82 she had a twenty-third child at age 83. At age 84 she had a twenty-fourth child at age 85. At age 86 she had a twenty-fifth child at age 87. At age 88 she had a twenty-sixth child at age 89. At age 90 she had a twenty-seventh child at age 91. At age 92 she had a twenty-eighth child at age 93. At age 94 she had a twenty-ninth child at age 95. At age 96 she had a thirtieth child at age 97. At age 98 she had a thirty-first child at age 99. At age 100 she had a thirty-second child at age 101.

At the age of 46 the patient had a tumor which was diagnosed as a granulosa cell tumor. The tumor was removed and the patient was followed up. The patient had a recurrence of the tumor at the age of 48. The tumor was removed and the patient was followed up. The patient had a recurrence of the tumor at the age of 50. The tumor was removed and the patient was followed up. The patient had a recurrence of the tumor at the age of 52. The tumor was removed and the patient was followed up. The patient had a recurrence of the tumor at the age of 54. The tumor was removed and the patient was followed up. The patient had a recurrence of the tumor at the age of 56. The tumor was removed and the patient was followed up. The patient had a recurrence of the tumor at the age of 58. The tumor was removed and the patient was followed up. The patient had a recurrence of the tumor at the age of 60. The tumor was removed and the patient was followed up. The patient had a recurrence of the tumor at the age of 62. The tumor was removed and the patient was followed up. The patient had a recurrence of the tumor at the age of 64. The tumor was removed and the patient was followed up. The patient had a recurrence of the tumor at the age of 66. The tumor was removed and the patient was followed up. The patient had a recurrence of the tumor at the age of 68. The tumor was removed and the patient was followed up. The patient had a recurrence of the tumor at the age of 70. The tumor was removed and the patient was followed up. The patient had a recurrence of the tumor at the age of 72. The tumor was removed and the patient was followed up. The patient had a recurrence of the tumor at the age of 74. The tumor was removed and the patient was followed up. The patient had a recurrence of the tumor at the age of 76. The tumor was removed and the patient was followed up. The patient had a recurrence of the tumor at the age of 78. The tumor was removed and the patient was followed up. The patient had a recurrence of the tumor at the age of 80. The tumor was removed and the patient was followed up. The patient had a recurrence of the tumor at the age of 82. The tumor was removed and the patient was followed up. The patient had a recurrence of the tumor at the age of 84. The tumor was removed and the patient was followed up. The patient had a recurrence of the tumor at the age of 86. The tumor was removed and the patient was followed up. The patient had a recurrence of the tumor at the age of 88. The tumor was removed and the patient was followed up. The patient had a recurrence of the tumor at the age of 90. The tumor was removed and the patient was followed up. The patient had a recurrence of the tumor at the age of 92. The tumor was removed and the patient was followed up. The patient had a recurrence of the tumor at the age of 94. The tumor was removed and the patient was followed up. The patient had a recurrence of the tumor at the age of 96. The tumor was removed and the patient was followed up. The patient had a recurrence of the tumor at the age of 98. The tumor was removed and the patient was followed up. The patient had a recurrence of the tumor at the age of 100. The tumor was removed and the patient was followed up.

This case illustrates retrogression of a granulosa cell tumor with control of postmenopausal bleeding for a period of 6 years as a direct result of roentgen therapy. On the other hand roentgen therapy failed to prevent recurrence of the tumor as was also true in the other cases in which the patients died from a similar recurrence. No definite claims can be made in 13 additional cases in which postoperative roentgen therapy was given. It is extremely difficult to evaluate the beneficial effects of irradiation in the case of a neoplasm which like the granulosa cell tumor possesses such a low incidence of clinical recurrence.

SUMMARY AND CONCLUSIONS

Sixty-two granulosa cell tumors were removed surgically at the Mayo Clinic between 1910 and 1944. The constituents 1.63 per cent of 3,800 ovarian tumors encountered during this period. About 60 per cent of these tumors were found in women who had passed the menopause.

The most common clinical symptoms were uterine bleeding (4 per cent of 6 cases), amenorrhea (2 per cent) and abdominal enlargement (29 per cent). From a study of the record it was apparent that the tumors that produced these symptoms grew slowly and might have been present for as long as 3 years.

Laparoscopy performed in the case of a man at age 45 years gave positive results at unit 1. The patient voided 1 liter of urine excreted during the first 4 postoperative hours. The excretion of estrogen dropped to zero.

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CONGENITAL MALFORMATIONS OF THE FIRST THORACIC RIB

A Cause of Brachial Neuralgia Which Simulates the Cervical Rib Syndrome

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As a result of a large number of published articles and with clinical experience the circulatory disturbances and neuralgias of the upper extremity which frequently result from cervical ribs or hypertrophy of the anterior scalene muscle are well understood. In 1916 Halsted was able to find 716 case reports of cervical ribs. It is not generally appreciated, however, that a similar picture may be produced by a congenital abnormality of the first thoracic rib. We are taking this opportunity of reviewing the literature and adding 10 new examples of this little known anomaly. Five of these have come to operation for relief of specific complaints while 5 others have remained wholly asymptomatic. Roentgenograms are reproduced of 8 of the 10 cases to illustrate different varieties of the deformity.

REVIEW OF LITERATURE

Judging from the lack of general knowledge concerning first rib anomalies their existence should be extremely rare. This, however, is not the case. As long ago as 1912 Wingate Ford (63) reported that variations in the shape of the first rib were very frequent. While such deformities have been encountered repeatedly by anatomists and have been described as dissecting room curiosities and in recent years have aroused the attention of a few radiologists, they have not received the

clinical recognition they deserve. Haven, in reviewing 5000 routine x-ray films of the chest, found 38 abnormalities of the first thoracic ribs against 37 cervical ribs. Of these 38 cases, 19 were in males and 19 in females. The abnormality of the first rib was bilateral in 2 cases, 17 occurred on the right side and 19 on the left. Furthermore, the incidence of symptoms was at the same low rate in both groups of cases, as only 2 out of each group had any complaints referable to the deformity. In recent studies of large series of routine thoracic films, Litter found 68 cervical and 31 abnormal first thoracic ribs in 40,000 and Sycamore 10 of each in 1,000 students at Dartmouth College. It is therefore probable that if radiologists in general scrutinized the routine chest film with special attention to the bony construction of the thoracic apex, many more minor variations in the first ribs would be detected.

The first unmistakable anatomical report of this malformation has been attributed by Dow to Hunsauld. In 1740 he communicated to the Royal Academy of Sciences in Amsterdam a memoir (2) on variations in the number of ribs. He described a portion of an adult skeleton in which the first rib on each side, well formed posteriorly and articulated with the first dorsal vertebra, became blended with the second rib, which was by this union much larger than usual. This anomaly must be very similar to that which is illustrated in our third and sixth case. Dow also cites the early dissecting room findings of Knox, Sandiford, Turner (67, 68) and Struthers, all published prior to 1875. The earliest review of the literature which we have been

of the literature which we have been

able to find was written by Arbuthnot Lane (34) in 1885. Ten years later Helm described 16 cases which he had been able to find between 1833 and 1885. Keen added more of his own and 19 other references were cited by Jones in 1910. Most of these are descriptions of anatomical and postmortem dissections and contain no account of clinical symptoms or operations. In the past 5 years cases have been reported by Hvoslef, Clerc, Didier and Bobrie, Brickner and Milch, Joubert de Beaujeu and Rollin (29-30), Bruett, Remynce, Carroll, Gladstone and Wakeley, Levi, Henry, Lindgren, Adson and Allen and Walshe, Jack and Wyburn-Mason. A few other references have been given in the papers which are not included here. Many of these more recent writers report cases of patients that have come to operation.

Brickner and Milch (8) in an article which appeared in this journal in 1935 and Walhe and associates in a description of 3 cases which reached this country while this paper was in preparation have given particularly valuable presentations of this subject. We have taken the liberty of quoting extensively from these two excellent reports. As far as Brickner and Milch could determine the credit for having recognized and described the production of symptoms by an abnormal first rib should go to W. W. Keen. One of his two cases, report of which was published in 1907, was in a 1-year-old man with the history of a long-standing mass in the neck and a 4-month-old brachial neuralgia. Roentgenograms showed that on the left side the first rib instead of curving forward from the spine as does the right, changes its direction at its articulation with the transverse process and thence runs almost in a straight line downward and outward. The tip of it is lost at the point where the first rib and the clavicle cross each other. No operation was performed on either of Keen's patients.

ANATOMICAL VARIANT OF FIRST RIB AND THEIR PROTOTYPES IN LOWER ANIMALS

The first thoracic rib may, how a great variety of malformation. These comprise rudimentary floating and bicipital ribs, central defects bridged by ligamentous bands,

exo-to-se and elongated jointed structures such as are illustrated by Brickner and Milch and by our Case 5. Correlated skeletal variation among the lower animals and embryological causes of malformation in man both contribute to our knowledge of this subject. Dr F. T. Lewis, professor emeritus of comparative anatomy at Harvard University, has been of the greatest help to us in the preparation of the brief summary which follows.

Variations in the development of the upper rib may be subdivided into three principal groups:

1. *Failure of the ribs to reach the sternum.* Allan has pointed out that in vertebrates as far back as the shark the number of ribs which reach the sternum varies from zero to a large number. All the ribs may never connect with the sternum as in various fishes and the frogs, or a series of them may reach the sternum with floating ribs both above and below. This is true of birds (Stresemann) and man where with the normal floating lower ribs there may be anomalous cervical and 11 formed first ribs. In the earliest stage in both the pig and the cat continuity is lacking between the first and second ribs and the sternum (Whitehead and Waddell). In man the rudimentary first ribs form a synostosis or pseudarthrosis with the second; the type of bicipital rib described in whales by Turner (67). In these cases the junction of the ribs is usually close to the point of insertion of the anterior scalene muscle and the crossing of the trunks of the brachial plexus and subclavian artery (Jones). Instead of fusing with the second the first rib may sometimes bend at the level of the ulcus (Bryce) or have an unusually high position (Keen) or remain floating in the soft tissues at the base of the neck (Keen, Turner). Such floating ribs may have a ligamentous prolongation joining them to the second rib or the sternum (Todd, 6). Downhill. At times the ligamentous portion again becomes bony and articulates with the manubrium (Downhill).

The division of ribs into vertebral and serratus porters. Division of the ribs into vertebral and serratus porters, the Eurapophyses and hemapophyses of Owen's



Fig. 1. Geog. W. KOTC. N. y. N. S6. 944. 1st R. t. th. k. gr. h. m. g. m. t. p. e. f. first. b. s. f. N. y. f. l. t. k. s. e. l. e. c. l. a. t. b. e. use. f. p. r. i. g. t. p. l. l. f. s. a. b. h. f. l. d.

bl. th. houl. This. fl. l. l. th. try. al. tes. fra. t. f. th. first. rib. described. by. Alder. so. A. p. o. t. t. t. r. e. f. t. g. f. scat. t. b. t.

archetype skeleton is characteristic of lizards, crocodiles, birds, and mammals (Hower, Stresemann, Tuckman). In mammalian thoracic ribs may be more or less calcified while in archetypal they are well ossified and articulate by synovial joints with the sternum and vertebral ribs. These are comparable to the human first rib with a central ligamentous portion as described by How and to the articulated ribs which are described herein. Helm has put forward the theory that such an articulation in a rib may be a compensatory mechanism to provide sufficient respiratory excursion of the chest in case of abnormal synostosis with the rib below.

Clinical and radiological descriptions of jointed ribs have been published by Vinogradov who encountered this anomaly in 6 cases of cervical ribs, also by Litter and Halbermann. In the first thoracic rib this anomaly has been described by Tuckman, Lane (3), Seamon, Bricker and Vilch (5), Reimann, Jaubert, Baur, and Kollin (20, 21) and Walbe and Lissacrite. In the last three articles four of the first rib anomalies are illustrated where the articulation is further lateral and there is only a short length of the first rib beyond the joint which fuses with the second as a bony spur. Walbe and his colleagues have classified this malformation as an extension of the second rib into the first. In these cases the bony projection is a long and closely resembled the union of a rib that

it has seemed more logical to us to consider the anomaly as a jointed first thoracic rib. Some writers have claimed that this condition is due to an old fracture of an abnormal rib but no accounts of significant injury have been recorded (Litter). So-called stress fractures of the first rib have recently been reported by Alderson but these as illustrated in Figure 1 appear as simple breaks in the continuity of an otherwise normal rib and in no wise resemble the congenital anomalies here described. In these cases also a history of severe trauma is usually lacking. Kochler (quoted by Alderson) has stated that fractures of the first rib are extremely rare and are generally spontaneous fractures due to muscular contraction. They should not be confused with developmental abnormalities of the first rib. We have been extremely skeptical about the traumatic etiology of these so-called stress fractures but one of us (M.H.) has recently had occasion to compare a routine chest film in a young naval aviator (Fig. 1a) with a film repeated several weeks later because of upper thoracic pain which followed a heavy blow on the shoulder. This second roentgenogram (Fig. 1b) shows the type of fracture described by Alderson and present clear cut evidence that it can occur as a result of trauma. It is therefore possible to theorize that such a fracture could occur in the type of an ankylosed first rib illustrated in Figure 1c and as the result of non-

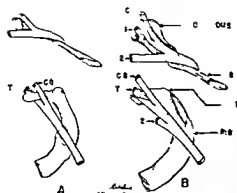


Fig. 1. R. p. d. t. i. h. l. h. t. m. d. f. e. a. t. i. f. d. r. a. s. r. t. i. b. j. e. s. t. h. w. t. l. o. g. i. c. a. l. d. e. n. c. e. f. p. o. s. t. e. r. i. o. r. p. l. a. x. u. i. n. t. h. d. e. v. e. l. o. p. m. e. n. t. f. r. u. d. i. m. e. n. t. a. r. y. f. i. r. s. t. t. h. c. i. r. i. b. A. n. a. l. m. a. l. r. e. l. a. t. i. o. n. f. a. s. t. r. o. c. a. l. d. f. i. r. s. t. t. h. r. a. c. i. v. e. s. t. h. r. e. m. f. i. r. s. t. b. b. C. m. p. r. e. s. d. p. a. i. r. e. d. g. r. t. h. f. i. r. s. t. t. h. r. a. c. i. b. h. e. n. s. e. e. d. t. h. c. i. p. n. a. l. r. i. b. i. e. s. l. a. r. g. e. b. r. a. h. i. t. b. r. a. c. h. i. a. l. p. l. a. x. u. s. u. t. i. f. d. i. t. p. e. r. a. t. i. o. n. C. a. s. e.

union from respiratory movement produce in some of the publication mentioned the type of jointed rib deformity decribed and in our Case 3 (Fig. 1). We still believe however that these abnormal articulations which are occasionally found in the first rib are more likely to be of developmental than traumatic origin.

3. *Other features of anomalous first ribs* There are further idiopathic development such as exostosis (Carroll Maynard) and multiple center of ossification—poradic and unaccountable irregularity. In the presence of a congenital hemivertebra the first rib may be lacking altogether (Cladstone and Wakeley). In addition to the abnormal development of the first rib coexistent abnormalities of the second rib are very common and to a

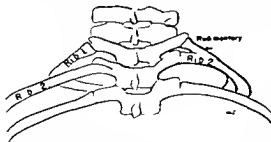


Fig. 2. Trace from radiogram of Case 12. The first rib is more elevated and has a different relation to the second rib.



Fig. 3. Photograph of first rib, Case 12. The rib is deformed and has a prominent bump on its surface.

be considered other skeletal malformation such as a change in the upper end of the sternum (Helm), cervicothoracic collar and deformity of the vertebrae. The two latter phenomena have been particularly stressed by Walhe Jackson and Waburn Mason.

ETIOLOGY

Two cardinal theories have been advanced to explain the development of cervical ribs and maldevelopment of the first rib. According to Jones it is the nerve that are the dominant factor in shaping the destinies of the future rib because they develop before the skeleton and are the important factor in governing the arrangement of the primitive body segment. In this connection he has pointed out that the subclavian groove in the first rib is really formed by an ill-defined lower end of the brachial plexus. It is misleading to regard it as a groove for the subclavian artery while at the same time in front of the nerve. In fact the subclavian artery is not yet formed at this time. Jones further argues that this development will be allied with subclavian brachial. He further states that it is permissible to assume that there can be a maldevelopment of the first rib and that the extra ribs are not in these cases a



Fig 5 X y p t f C 3 h g l t t
ly f f t t h l th d ribs b
ly b a l e d d t h l i g h t s e t o x t h
t p e t t h f i t h t b T l t r a t p o t
f t h n l t h l f t h b e e e s e t d t t h h o s p i t l
l e a g 3 t t e n t l i t t t g f m t h
t r s e f x d l g b o j l b e h l t h
l l t t h l t t h s e f i t t k l t d t t d
l)

as a rule by the inclusion of the second thoracic nerve in the brachial plexus (Fig 2). This has also been emphasized by Hertsl and Keith and by Dow although the latter has pointed out that the rib may end at some distance lateral to the crossing of the nerve. In those cases in which a seventh cervical rib is unusually well developed the first thoracic nerve often fail to join the plexus at least in its normal bulk and it is probable that different degrees of development of cervical ribs show the effects of varying contribution from that nerve. Cervical ribs are therefore liable to occur with a prefixed type of brachial plexus while an mal u first rib are found when the second thoracic nerve is an important component in posterior fixation. Sargent who has described absence of a first thoracic contribution to the brachial plexus encountered in the course of resecting a cervical rib suggested that this anomaly is more common than a prefixed one. Walsh and coll agrees with that a rudimentary first rib is rarely associated with a large contribution of the second thoracic root to the brachial

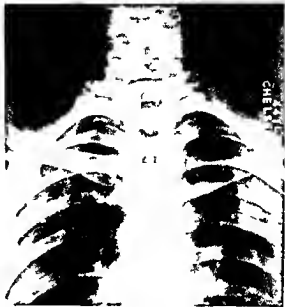


Fig 6 X y p t f C 4 h g l t t
l i t t p d p e p h r a l j (d t t e d t l) f b
m l f i r s t r i b m g f t j l t e s e c t t
t h h o s p i t a l T h c e t r a l i p e a s e d y n i t b y
p j t g g a u t t h b h t p l f b e h l T l
s e d n b b o t g h t l y d f e d d b d d l e l
t h p o t t t e u t t t l t h f i r s t

plexus but state that an added cervical rib is not necessarily related to a prefixed plexus. Wingate Todd (6) add confirmatory evidence to this theory by finding that the



Fig 7 X ray p f Case 5 Th f r e s t t h
l f b m l l y l o n g n d l e s t h r t l t h
l l d l s e g l T h f t h j l b l t h
l l l h l l l p o r t f t l j l d l
g l d s o d e g r e e s f s e t h b r a c h n e d s e c t l



b



F. S. Abnormalities of first thoracic rib. 3 patients with related symptoms. Case 6: Bicipital type. First ribbed from thy. Th. m. h. gu. b. l. t. h. b. h. a. cut. l. or m. o. c. l. a. l. i. a. m. t. h. a. b. e. e. n. r. e. s. t. e. d. b. y. t. h. r. e. a. f. t. h. k. n. e. d. b. o. t. h. p. o. t. i. f. f. b. e. t. w. e. e. t. h. f. i. r. s. t. and s. e. c. o. n. d. r. i. b. s. Case 7: L. m. p. l. e. d. a. t. t. e. m. p. t. t. f. i. f. i. r. s. t. d. s. e. c. o. n. d. r. i. b. s. b. t. f. i. f. i. r. s. t. h. a. s. k. e. p. t. t. r. m. l. e. a. t. i. o. n. c. u. l. t. w. i. t. h. t. r. m. m. b. t. b. o. t. h. t. a. d. t. h. s. e. c. o. n. d. b. t. h. k. e. n. e. d. a. d. e. a. l. j. u. n. e. d. a. s. t. h. y. c. r. o. s. b. e. h. i. t. h. c. l. a. f. Case 8: L. f. t. f. i. d. i. s. t. a. l. d. f. i. r. s. t. d. s. e. c. o. n. d. b. t. f. i. f. i. r. s. t. a. d. t. h. c. e. r. v. i. c. h. r. a. c. i. s. e. l. o. w. h. u. h. t. r. s. t. h. c. o. r. r. e. s. p. o. n. d. e. r. t. b. r. a. T. h. g. e. n. e. r. a. l. b. e. y. m. a. i. n. r. e. s. e. m. b. l. e. s. Case 9: d. t. h. r. e. p. o. r. t. e. d. x. a. m. i. n. e. s. h. r. e. j. u. s. t. i. n. r. e. p. o. s. e. d. b. e. t. w. e. e. t. h. f. i. f. i. r. s. t. h. a. n. d. t. h. p. e. c. t. i. n. g. p. u. l. b. e. f. o. m. h. s. e. c. o. n. d.

ulceration of the brachial plexus is either nearly absent or altogether absent in the left arm with cervical ribs. This anatomist has accepted Jones's neuroembryological theory of rib malformation but believes that these errors in embryonic segmentation cannot all be ascribed to this single cause. He has advanced the additional importance of vascular influences and be-

lieve that variations in the arterial tree are prone to influence the development of the upper ribs on the left side. In our example to be described the first patient had a pre-fixed brachial plexus with a large contribution from the second thoracic root and the fifth patient had a complete transposition of the subclavian and carotid arteries on the left side.

Neither of these theories can account for the occasional appearance of a bicipital rib below the first thoracic segment. In the Radiological Department of the Naval Hospital there is a routine chest film in which the second rib ends at the midaxillary line and fuses with the third whose shaft is considerably broadened at this point. This suggests that any of the upper ribs if they fail to reach the sternum tend to become attached to the rib below and by the resulting fusion form a bicipital rib.

It is worthy of comment that with abnormal first ribs as is also the case with cervical ribs and the scalenus anticus syndromes symptoms are rarely encountered before the age of twenty. This has been explained by Todd (66) in his account of the descent of the shoulder after birth. Since the upper limb develops at the level of the seventh cervical segment the first and second thoracic nerves must first run upward until they have crossed the uppermost rib and then angulate downward to enter the arm. Because of this arrangement any elevation of the rib or depression of the shoulder must stretch these lower connections with the brachial plexus. Todd has shown that in the course of normal skeletal development there is a gradual descent of the shoulder with advancing years. This tendency is of course exaggerated when the individual carries any heavy weight and is reduced when the weight is taken off the arm by supporting the elbow in a sling or on the arm of a chair. It is just these maneuvers which frequently result in exacerbation or relief of symptoms (see the clinical histories herein reported).

In addition to the disturbances caused by a congenitally deformed rib brachial neuralgia has been ascribed to pressure irritation of the lowest roots of the brachial plexus by an apparently normal first thoracic rib. Numerous examples of this condition have been described by Buzzard, Bramwell and Dyles (5, 6), Stiles, Murphy, Morley, Stopford and Telford, Wheeler and Brickner (7). Many of these patients were relieved by resection of portions of the first rib but all were reported prior to the classical paper of Adson and Coffey (2) which appeared in 1917 and

brought out the rôle of the anterior scalene muscle in compression of the brachial plexus in the presence of a cervical rib. In view of Naffziger's (46) description of the anterior scalene syndrome in which brachial neuralgia is found in the presence of an apparently normal first rib it is our impression that the cases were probably examples of this condition and would have been relieved with equal success by scalenotomy. A few may have even masqueraded as protrusions of lower cervical intervertebral discs which may easily be mistaken for the scalene syndrome and probably account for some of the failures of scalenotomy. Very recently Walshe, Jackson and Wyburn-Mason have claimed that compression of the brachial plexus and subclavian artery may be produced by the clavicle as it approaches the first rib in cases of extreme sagging of the shoulder.

Granted that a significant deformity exists at the thoracic outlet the onset of symptoms frequently depends on some form of trauma to the shoulder girdle. A large proportion of the reported cases of anomalous first or cervical ribs with brachial neuralgia or vascular disturbances have occurred in service personnel soon after induction. Many of these men who have been leading relatively sedentary lives first develop symptoms after carrying a heavy pack or weight on the shoulder or following a sudden muscular strain. Four out of our five cases with brachial neuralgia are in Naval personnel and one of them (Case 4) noticed the onset of his neuralgic pain following trauma.

SYMPTOMS PRODUCED BY MALFORMATIONS OF FIRST RIB

Symptoms and signs produced by congenital deformities of the first rib fall into three main groups:

1. *Local* The cases include bony projections in the supraclavicular fossa which can be felt and sometimes seen. Often the subclavian artery lies in an abnormally high position in the neck and sometimes its pulsations are visible beneath the skin. The bony deformity is often a cause of vascular or neuralgic symptoms when the rib ends at the scalene tubercle which is unfortunately the

most common arrangement. Here it may form a synostosis or pseudarthrosis with the second rib and its termination may be expanded by a prominent capsule. More rarely it continues as a band of fibrous tissue to its normal attachment with the sternum or ends as a bony tip in the soft tissues. In an unusual complication described by Henry the sharp free end of the rib was a cause of intermittent pneumothorax.

Vascular. Circulation in the arm is often reduced. This may be apparent at a glance when the hand is discolored and very cold, particularly if trophic disturbances are present. The radial pulse may be absent but often it is necessary to compare the blood pressure in both arms while downward traction is made on the affected side or the patient rotates his chin in this direction, throws his shoulders back and takes a deep breath (Adson and Allen 1). Brinkner and Milch and also Walshe and colleagues have reported cases with an arterial bruit. Reduced circulation in the arm has been ascribed by Todd (6), Stopford and Telford and Wilson to the irritation of sympathetic fibers in the lowest cord of the plexus. Walshe and his colleagues have described a patient with an associated Horner's sign and loss of sweating of the right face, neck and upper extremity. As these observers pointed out it is obvious that the rudimentary first thoracic rib in this case must have produced a sympathetic paralysis, not of peripheral origin from compression of the plexus but from injury in the region of the cervicothoracic ganglion which carries sympathetic fibers destined for the head as well as the upper extremity. To account for the common reduction of circulation seen in the arm one would have to assume an irritative action on the sympathetic axones in the brachial plexus which should be accompanied by hyperhidrosis and possibly pulmotor disturbance in addition to vasoconstriction. Neither we nor any other writers have observed these manifestations with either cervical or abnormal first thoracic ribs. Furthermore as Sir Thomas Lewis (3) has shown neurogenic constriction of the arteries is never sufficiently intense to obliterate their pulsations.

In short as Walshe and colleagues have summed up the argument it seems clear that there are no grounds upon which we can reconcile coldness, cyanosis, pallor and tingling of the hands with involvement of sympathetic fibers and that there are many grounds upon which we must relate them to compression of the subclavian artery. When this is severe and long continued intimal changes may occur and result in local or widespread thrombosis. This has been described in first rib anomalies by Russell, Bruett, Kenney, Lindgren, Adson and Allen (1) and Walshe and his coauthors. Among the clinical histories of the peripheral circulation and the private wards of the Massachusetts General Hospital there are 2 cases of cervical rib in which thrombosis appears to have broken off and caused emboli to lodge in the brachial and digital arteries. Lewis and Pickering (39) and Walshe and colleagues have recorded similar complications. This may well have been the case in Lindgren's patient with an anomalous first rib and subclavian aneurysm at this point as the brachial artery was occluded in the mid upper arm. Venous congestion and the formation of collateral channels from compression of the subclavian vein by a normal first rib has been reported by McLaughlin and Popma and by Sampson, Saunders and Capp. The presence of a malformation in the first rib might well be present in this condition and should be sought for although to our knowledge no instance has yet been reported. This may be explained by the fact that most anomalous first ribs are rudimentary and end at the scalene tubercle before the point of crossing of the subclavian vein.

3. Neurological. Local tenderness on pressure over the prominent rib behind the clavicle with at times radiation of pain down the arm are frequently present. Sometimes the plexus can be rolled over the underlying bony prominence and tingling paresthesias produced in this way (Case 5). Numbness

In the E. section of D. H. H. F. on section of the outside portion of the brachial artery was performed prior to the removal of the rib. It was found that the primary cause of occlusion was embolism. The artery was found to be occluded in the middle of the artery. The artery was found to be occluded in the middle of the artery. The artery was found to be occluded in the middle of the artery.

may be present in the more severe cases or when the shoulder is drawn down by lifting a heavy weight. Such sensory changes may be only subjective. When objective pathologic sensibility is more likely to be reduced than paresthetic (Wilson). It has seemed to us that in the cases the pain is not as likely to be limited to the distribution of the ulnar nerve as in the case of cervical rib or scalene compression. This however is not always true as cases of cervical ribs have been reported by Dejerine and Wilson in which pain was referred to the lateral side of the hand. Swank and Simeone have reported a number of instances of the anterior scalene syndrome in which pain referred to the upper plexus distribution was relieved by scalenotomy. The most complete description of neurological changes in the arm due to an abnormal rib has been given by Kinnier Wilson. He pointed out that the neuralgic pain, paresthesias and muscular weakness may be limited to the ulnar area or involve the thenar eminence and radial side of the hand and forearm. To account for this he has pointed out that the medial head of the median and the ulnar nerves have a common origin from the eighth cervical and first thoracic spinal nerve roots. Walhe and colleagues have stated that nerve compression like arterial need not be produced at the sulcus nervi brachialis. If it occurs more peripherally as when the clavicle squeezes down on the deformed first rib other portions of the sensory and motor outflow to the arm may be involved. In addition to the sensory manifestations motor weakness with wide areas of loss of power in the arm may be present and atrophy of the arm and intrinsic hand muscles has also been reported in no wise different from the paralytic seen with cervical ribs. Loss or reduction of reflexes is an additional sign. The reduction in motor power may be secondary to impaired circulation as well as to direct paralysis of motor nerve fibers (Landgren and our Case 1).

We have been unable to differentiate congenital abnormalities of the first rib from cervical rib or compression of the anterior scalene muscle on the basis of clinical symptoms or physical signs alone. A similar

conclusion has been reached by Walshe and colleagues. The sensory disturbances may be somewhat more widely distributed in the former condition but this is not definite enough to be counted on. Even with an ordinary anteroposterior x-ray picture of the cervicothoracic spine bilateral malformation of the first thoracic ribs can easily be mistaken for cervical ribs as the mandible hides the upper cervical vertebrae and it is not possible to count down from the atlas to identify the first thoracic segment. A lateral film is not too helpful because it is often difficult to define the exact vertebra to which the uppermost rib is attached. It is essential to be able to outline all the vertebrae in the neck and upper thorax on an anteroposterior film which shows the details of the upper rib articulations as well. This can be accomplished by making a long exposure with the patient opening and closing his mouth. In this way the shadow of the mandible is blurred so that it does not obscure the outlines of the atlas and axis vertebrae. Anteroposterior x-ray films should include the whole of the second as well as the first rib as the anomaly often involves the two. All of the bony structures bounding the thoracic apex require careful scrutiny. In unusual cases it may be advisable to include the entire spine so that the total number of ribs and lumbar vertebrae can be counted. Unless these precautions are observed first rib deformities will be missed. After an examination of skigrams reproduced in many articles which purport to illustrate typical cervical ribs we as well as Walhe and his colleagues have been impressed at finding that some have been misdiagnosed even by roentgenographers and actually represent malformations of the first thoracic rib.

While the presence of a malformation of the uppermost rib can often be diagnosed by the clinical evidence of a mass with compression of the brachial plexus or subclavian artery and its vertebral origin determined by roentgenography it is still important to make certain that it is the actual cause of the symptom. Other conditions which can give rise to nearly identical complaints are neoplasms of the superior pulmonary sulcus (40) cervical arthritis and herniation of one of the lower

cervical intervertebral discs. While such diagnostic errors could not be made in the presence of a large first rib deformity with evidence of postural arterial compression a concomitant disc herniation could easily be missed in the presence of a rudimentary first cervical rib and symptoms limited to neuritic manifestations. This complication could have been present in our Case 2 in which coughing, sneezing and turning of the head caused pain to radiate to the shoulder and arm. Under these circumstances lumbar puncture should always be performed and in addition a myelogram with opaque oil if the cerebrospinal fluid protein is elevated.

PERSONAL CASES

Our experience with malformations of the first thoracic rib comprises 10 cases, 3 of whom required surgical intervention for relief of neuralgia with superimposed thrombosis of the subclavian artery in the first patient. The other 3 had no specific complaints and were discovered in the routine examinations of thoracic x-ray films made for other conditions. The case histories of the patients upon whom operations were performed are given in detail below. Of the asymptomatic group roentgenograms of 3 which illustrate interesting variations of this anomaly are reproduced in Figure 8. The remaining 2 who had deformities resembling those already described are merely mentioned for statistical purposes.

CASE 1. Mrs. H. L. T., aged 35 years. Congenital malformation of first and second ribs on left with compression of brachial plexus and subclavian artery. Postural fixation of brachial plexus. No improvement after scalenectomy but good result following subtotal resection of ribs and preganglionic sympathetic.

For months prior to her first admission on to the Massachusetts General Hospital this woman noticed a numbness in the fingers of her left hand. Gradually subjective hypesthesia developed in the hand as well as paresthesia after use. For the past 2 months she had complained of dull pain in which she could usually relieve by abduction of the shoulder. On admission a bony prominence was palpated in the brachial plexus area on the left and the subclavian artery somewhat more prominent than usual. In addition a widespread paresthesia of the hand and fingers was observed that was particularly distinct along the radial nerve distribution. The pain was more than tolerable but it was not relieved by rest or analgesics.

At first with normal blood pressure readings were 120/80 on the right and 120/80 on the left. Temperature measurements brought out a red color of the fingers in the left thumb and small finger at 12 degrees F in the middle finger (room temperature of 68 degrees). Ergometer test showed a group of 10 kilo-grams in the right hand 60 in the left. Her general physical examination was not otherwise remarkable except for obesity. X-ray film which unfortunately was destroyed at the end of a 5 year interval was at first interpreted as showing a bilateral cervical ribs. However on closer study the number of ribs it was found that there were only twelve pairs. The upper one on the right a complete rib and articulated with the sternum but the one on the left formed a pseudarthrosis with the middle of the second rib. A routine lumbar puncture was normal.

October 3, 1930, exploration of abnormal first rib and division of left anterior scalene muscle performed. After careful dissection a palpable artery was evident that the anterior scalene muscle was unusually tense. When cut across its ends retracted widely and we felt that it accounted for at least in part for the irritation of the brachial plexus. There was no definite evidence however that the subclavian artery was compressed. The artery was unusually prominent and looped around the lateral edge of the muscle but it pulsated normally. The deformity in the ribs was found to consist of a pseudarthrosis with a thickened capsule where the underdeveloped first rib joined a hypertrophied second rib just beneath the point where it crossed by the artery and nerve trunks. As the myotomy seemed to have relieved all pressure on these structures no effort was made to remove the rib deformity. This proved to be an error as later developments brought out.

Convalescence was uneventful. On re-examination 6 weeks later she had no objective complaint but the small subcutaneous abscess in the left hand finger. All the fingers of the left hand were cold and the color of this hand distinctly darker than the right. When next seen on February 29, 1931, she had no complaint but by the following autumn her original subjective symptoms had returned. In addition to the temperature and color changes in her left hand the radial pulse had disappeared and blood pressure readings were barely obtainable from the brachial artery. She was therefore advised to return to the hospital and was readmitted on October 22, 1931. At this time her pain was not so severe as on her previous admission (only a dull ache) but she complained of a disturbing numbness in her skin especially at evening. Again the numbness was particularly subjective sensation but pulsation in blood pressure readings could be obtained in her left arm. Tests to determine the rate of muscular fatigue (compressor ergometer) 13 km 36 times a minute showed that contraction of the left hand could be continued for only 1 minute and so could be set for

severe pain: the muscles of the forearm which resists the exercise could be kept up: the normal right hand for 5 minutes and 5 seconds after which there was inability to do further work but no actual pain. When a tourniquet was applied to the right arm fatigue and pain occurred in 2 minutes and 35 seconds.

October 28, 1930. Diagnostic paravertebral procaine block of the upper thoracic ganglia in the manner originally advocated by one of us (J.C.W.) resulted in a dramatic increase in temperature to the normal vasodilatation level but no return of the radial pulse. Her ability to flex her fingers at a constant rate against a given resistance was then compared with previous trials. Although the increased blood flow did not augment her capacity to work the onset of fatigue no longer brought on the painful elation.

October 29, 1930. Subtotal excision of the left first and second ribs and preganglionic sympatheticotomy under intratracheal ether anesthesia were done. Exposure was facilitated by a wide semicircular incision with lateral retraction of the scapula. In addition to a subtotal resection of the fused first and second ribs, the central portion of the third rib was removed to obtain the most effective exposure for a preganglionic sympathetic denervation of the arm (73). In the course of the sympatheticotomy it was found that the patient also had a posterior fixation of the brachial plexus with a large second thoracic nerve which ran upward to join the plexus. We were therefore unable to carry out the usual resection of the roots of the second spinal nerve but had to content ourselves with a careful resection of its sympathetic ramus which could be done with the second thoracic sympathetic ganglion.

Although the x-ray films are not large a valuable good idea of this unusual malformation can be obtained from Figure 3, a photograph of the specimen removed at operation. It is evident that we were dealing with a very large second rib joined by an abnormally small first thoracic rib. A posterior three or four centimeters lateral to the costovertebral articulation.

When I had seen 17 days after this operation the patient had no pain: her arm or hand in active movements and ergometer tests. Her left hand remained normal in color and distinctly warmer than the normal extremity although there had been no return of the radial pulse.

CASE 2. A 12-year-old girl, age 22 years, WT. 100 lb. Congenital malformation of first rib on left which fused with second causing irritation of brachial plexus. Partial relief following a thoracic sympathectomy.

This was the second episode of pain in the left supraclavicular region with radiation to the left arm and down the arm. It recurred with the fingers except the thumb. At times when the pain was severe his neck became stiff and painful. Movement coughing and sneezing hurt. He had discovered that under these circumstances he was most comfortable lying on his back with his neck

straight and weight off his arm. The present attack had started 6 weeks prior to his admission and had again partially cleared. Eight months previously he had developed syphilis but after a full course of antiluetic treatment the Kahn reaction and spinal fluid examination were normal. His physical examination was not remarkable except for the finding of distinct supraclavicular tenderness over the insertion of the left anterior scalene muscle with a distinct bulge in this area. The subclavian artery was more prominent on this side than on the right. Blood pressure readings were the same in both arms and it was impossible to shut off his radial pulse by any maneuver. Although neck movements had formerly been painful they were free at the time of this examination.

The x-ray picture reproduced in Figure 4, disclosed a rudimentary first rib which joined the second 3½ centimeters lateral to its articulation with the transverse process.

Owing to the local tenderness at the origin of the scalenus anticus it seemed more logical to explore anteriorly although total resection of the rib would have required a posterior incision.

On April 12, 1934, supraclavicular exploration and anterior scalene tomy were done. There was considerable fibrosis around the lower end of the scalene which was mainly inserted into the second rib. The subclavian artery and lower portion of the plexus were compressed between the lateral border of the muscle and the end of the rudimentary first rib.

After a smooth convalescence with early physical therapy and swimming he was discharged to duty after 4 weeks. He returned for a check up after a 7-month period of sea duty complaining of intermittent bouts of less severe discomfort in his left shoulder. These were not continuous and not very incapacitating. On being offered the choice between a trial of limited shore duty or resection of the rudimentary first rib he chose the first alternative. He did not feel that he had sufficient discomfort to require further surgery.

CASE 3. George R., aged 39 years, S. 2/c U.S.N. Bilateral congenital anomalies of first ribs with cervical and brachial neuralgia and partial compression of left subclavian artery. Postoperative return of left-sided pain due to incomplete removal of rib with residual bony spur. Two stage removal of bony spur followed by pressure symptomatic.

For the past year and a half this sailor had complained of pain in his left neck, shoulder and arm. Similar discomfort to a much lesser degree was also present on the right side. He had noticed a lump in the left supraclavicular fossa for several years. X-ray pictures taken at another Naval Hospital showed a bilateral congenital deformity of the first ribs. On the right side the rib was a mere rudimentary stump but on the left it measured some 8 centimeters in length and joined the second rib. The vicinity of the insertion of the anterior scalene muscle. On March 3, 1933, the first

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tosis Just posterior to the clavicle and extending back toward its vertebral articulation the rib was elevated and unusually prominent. It was impossible to shut off the radial pulse by any maneuver but pressure against the bony prominence produced tingling paresthesias in the ulnar side of the hand. There were neither objective sensory nor motor paralyses.

The x-ray picture reproduced in Figure 1 visualized a most unusual deformity on this side where the first rib arose at a very obtuse angle and ran nearly in a straight line for 7 centimeters from its transverse process. Here at a point just behind the clavicle it ended in a distinct joint. Below this articulation the distal segment of the rib changed direction abruptly to run 3 centimeters directly forward and fuse with a broadened anterior portion of the second rib. The results of 8 degrees of ulnar deviation in the first rib lay directly beneath the brachial plexus. On the right side the ribs were normal. (For reports of other cases of congenital cervical and first thoracic ribs and theories of the origin see foregoing.)

On March 19, 1945 the suprascapular artery was delicately exposed by a transverse incision. It gave rise to the bony clavicle which extended from the clavicular insertion of the sternocleidomastoid muscle and curved forward to the anterior border of the trapezius. The phrenic nerve together with a large accessory trunk was retracted medially and the innervated insertion of the anterior clavicle divided. After a wide exposure the bony second rib was anatomically and neurovascularly examined. The bony ends of the neck were carefully examined. It was then apparent that the posterior portion of the first rib became flattened and usually obtuse angle. The point of maximum prominence just behind the clavicle. Here the palpable bony mass was fused to the clavicle but a pseudarthrosis with cartilage covered bone end but with limited mobility. The portion of the rib anterior to this ran obliquely downward beneath the clavicle. The second rib. The cords of the brachial plexus lay directly over the projected articulation so that they were compressed and angulated by the underlying bone. At this point the space between the first rib and the clavicle was greatly narrowed so that the Walsh-Jackson and Wyburn-Mason theory of clavicular compression may well have played an important role. The clavicular anastomoses along the left innominate artery which gave rise to the subclavian and common carotid arteries were off the internal mammary and transverse scapular arteries and anterior thoracic arch rather than the subclavian's vertebral centers. Internal thoracic artery could be seen. By careful manipulation the brachial plexus was retracted far enough medially to permit freeing up a cutting the rib segment in between its point of cutaneous pulsation (sternocleidomastoid muscle). It was then a matter of few stitches to suture the anterior and trap with the

pleura. The rib anteriorly was then resected away to the pseudarthrosis where it disappeared beneath the clavicle. When this had been completed its forward end dropped down leaving the small distal stump well clear of the plexus and covered with a smooth layer of cartilage. A rubber dam drain was left in the extensive dead space from which the section of rib was removed.

Beyond some tingling paresthesias which were present for a few days there were no sequelae to this extensive manipulation beneath the pleura. The drain was removed the day following operation and the incision healed uneventfully. At the present moment 6 weeks after the operation he is nearly free of his former symptoms.

The symptoms of mechanical irritation of the brachial plexus and compression of the subclavian artery caused by a congenital malformation of the first rib are exemplified by the 5 cases here reported. To illustrate some further variations of these abnormal ribs the x-ray films of 3 additional cases are reproduced in Figure 8. These together with similar deformities in 2 other examples were the cause of no symptoms whatever but were picked up by one of us (M.H.P.) in the course of routine examinations of chest films. This series of 10 includes all the common manifestations of this deformity which we have been able to find in published case reports. Of the concomitant malformations cervicothoracic scoliosis was present in 3 (Cases 3 and 8) while deformities of the second rib occurred in every instance. Of the more rare complications which have been reported aneurysmal expansion of the subclavian artery, venous congestion, vertebral anomalies, Horner's syndrome from sympathetic paralysis and spontaneous pneumothorax have not been encountered. That these deformities have been found in 9 males to a single female is without significance as all but one were in Naval personnel. In Case 3 the deformity was bilateral but in all 5 patients with actual neuralgia the first rib on the left was the cause of the predominant symptoms. This again is probably of no statistical significance as in other reported cases the incidence has been approximately equal on the two sides. Onset of symptoms following definite trauma occurred only in Case 4.

It is worthy of comment that we have encountered only a single malformation of the

first rib in a civilian during the past 5 years and that the others have all been in U S Naval personnel. In the first half of the series our attention was directed to the condition by neuralgic pain. Four of these deformed ribs were in sailors seen during the 11 months period ending in March 1945. As has so often been the case with other new medical syndromes as soon as the condition has been recognized and the attention of a large clinic focused upon it new examples are then found with increasing frequency. Within the past 2 months 5 additional asymptomatic cases have been discovered. We are convinced therefore that anomalies of the first thoracic rib are no greater rarity than cervical ribs. Their presence should be sought for by roentgenologists and their symptomatology recognized by surgeons and orthopedists.

A summary of the type of symptoms and signs found in our patients follows. Supraclavicular tenderness was noted in all but 1 supraclavicular bony projection in all. As to sensory disturbances neuralgic pain was noted in all subjective numbness in 4 objective sensory loss in only 1. Of motor paralyses muscular weakness was noted in 3 muscular atrophy in 1 reflex changes in 2. As to vascular changes the subclavian artery was prominent in all arterial compression in 1 but there was found no venous compression no irritation or paralysis of sympathetic fibers.

As to pain distribution in Case 1 diffuse pain was noted in the fingers and hand in Case 2 pain was noted in shoulder arm and second to fifth fingers in Case 3 in occiput neck shoulder medial forearm and third to fifth fingers in Case 4 in shoulder arm and radial side of hand in Case 5 in occiput neck shoulder biceps elbow and ulnar side of hand. This summary shows that the neuralgia from an abnormal first rib is unusually widespread. It was limited to the ulnar side of the hand in only 2 cases including also the shoulder and upper arm in 4 and the neck and occipital region in 1. How the cervical plexus can be involved is not known.

Motor weakness also seems to be rather diffuse. It was not limited to the lower trunk of the brachial plexus and was not accompa-

nied by atrophy of the intrinsic muscles of the hand which are innervated by the ulnar nerve. Although the subclavian artery was forced upward by the underlying abnormal rib in all the 5 patients evidence of actual arterial compression was present in only 2. In Case 1 there was a slight postural occlusion of the radial pulse but in Case 1 the postural factor was at first pronounced and was later followed by thrombosis of the brachial artery. None of these patients had any evidence of sympathetic irritation or paralysis. In Case 1 sympathectomy restored an excellent blood flow by dilating the collateral channel although the thrombosed arteries remained occluded.

Mild cases of neuralgia due to a congenital deformity of the first rib may respond to orthopedic measures as is often the case in the scalene syndrome (Naffziger and Grant 4). These consist of improvement in posture, exercises to strengthen the trapezius and the other muscles which elevate the shoulder girdle and temporary support of the upper extremity by a sling arm of a chair or the recumbent position. Reichert has also described an arrangement of three pillows so that when the patient lies on his back the shoulders head and neck are forced forward. In the lateral position with the shoulder on the mattress between the two under pillows and the head on the third or top pillow this arrangement prevents lateral flexion or rotation of the cervical spine and thereby reduces compression of the plexus. In 4 of our 5 cases the bony deformity was such a definite cause of mechanical irritation that conservative measures did not appear to be worth a trial. Case 1 was referred to the orthopedic service but postural exercises proved ineffective. A period of conservative treatment might have been worth a trial in Case 2 where a second attack of brachial neuralgia was subsiding spontaneously but owing to the exigencies of a very active military hospital surgical exploration of the rudimentary rib and scalene myotomy were preferred. Following this review of the literature and personal experience with these cases it is our opinion that an abnormal first thoracic rib likely to produce more severe mechanical

than is a cervical rib. This is because cervical ribs are so often more rudimentary structures whereas anomalous first ribs are commonly lower and associated with greater deformities of the thoracic outlet (70). Advocates of treating cervical ribs by scalenotomy such as Adson and Coffey () and Patterson agree that when the anomalous rib extends forward to compress the brachial plexus and subclavian vessels it should be resected. This is generally the case with malformations of the first rib. As already mentioned Walshe and his colleagues have accounted for the frequent failure of scalenotomy in the relief of compressive symptoms on the basis of the mechanical role played by the clavicle. They have stated that the clavicle probably plays a far more significant role in the production of pressure symptoms in the presence of abnormal ribs than is commonly realized. This is particularly true in vascular disturbances where the clavicle and rib together constitute what we may call the vice in which the third part of the subclavian artery is currently gripped. This may well account for intermittent postural compression of the artery, aneurysmal dilatation and thrombosis or embolism. Such a mechanism may well explain the primary reduction in blood flow through the brachial tree and the final thrombosis seen in our first case. Here we were unable to determine the compressive rôle of the clavicle because we removed the bicipital rib through a posterior incision. In our fifth case however there was a definite vice like compression of the plexus between the prominent jointed deformity of the first thoracic rib and the clavicle which was released by resecting this portion of the rib. Anterior scalenotomy alone was performed in our first two subjects followed by only brief benefit in the first and lasting but not complete relief in the second where the rib was unusually rudimentary.

On the basis of our experience we plan in future cases to adopt the following policy. If the patient fails to obtain satisfactory relief from conservative orthopedic measures exploration should first be performed through a supraclavicular incision. Maximum exposure of the rib can be obtained if the lateral

end of the incision is curved upward a short distance along the anterior border of the trapezius. The descending branches of the third and fourth cervical nerves which cross the incision should be carefully preserved. The deep dissection should be extensive enough to permit a thorough examination of the brachial plexus with its accompanying blood vessels to the point where they cross over the rib in the subclavian groove. If the abnormal first rib is so rudimentary that it is hidden behind the middle scalene and can cause no mechanical irritation of the blood vessels and nerves the procedure may be limited to division of the lower end of the anterior scalene muscle above its anomalous insertion into the second rib. Such a rudimentary first thoracic rib will rarely be found. In the more common deformities where the first rib articulates with or fuses with the second at the scalene tubercle or continues forward as a prominent bony or ligamentous structure the anterior scalene must be divided and the abnormal rib excised from a point beneath the clavicle back to its disappearance in the posterior muscles of the neck central to the insertion of the scalenus medius. Every effort must be made to leave no bony spur projecting from the superior surface of the second rib as this is nearly certain to be a source of continued nerve irritation (Cases 3 and 4). A residual posterior stump over a centimeter in length is also likely to result in further trouble. This resection is more difficult than removing a cervical rib for the reason that the first rib is so much more deeply situated. It is therefore important that these operations should be carried out under intratracheal anesthesia and that care be taken to avoid perforation of the pleura injury to anomalous blood vessels or the thoracic duct (Barnes) or undue retraction of the brachial plexus. When the supraclavicular operation has been properly performed there should be no need for a second stage posterior removal of the central lump of the rib. This was necessary in our first patient because we had misjudged the need for resection of the deformed rib when the anterior scalene was cut. In Cases 3 and 4 the amount of rib resected at other hospital was totally

inadequate. We feel that after a previous incomplete removal of the upper rib from the front its remaining central stump can best be exposed and removed from behind through the incision described by White, Smithwick, Allen and Mixer.⁽⁴⁾ Wherever the cause of mechanical irritation has been radically removed the results have been satisfactory.

SUMMARY

1 Although congenital anomalies of the first thoracic rib are not extremely rare their clinical manifestations are less well known than those produced by cervical ribs.

2. First rib malformations generally consist of a rudimentary structure terminating in a synostosis or pseudarthrosis with the second rib near the calene tubercle or in a free end in the soft tissues at the base of the neck which may be connected by a ligamentous band with the manubrium sterni. On very rare occasions the first rib may have a distinct joint near its lateral angle before it fuses with the second.

3 Other skeletal abnormalities are frequently present which cause further distortion of the thoracic outlet. They consist of deformities of the second rib, the upper end of the sternum, scoliosis of the cervicathoracic spine, and vertebral anomalies.

4. Congenital malformations of first thoracic ribs as is true to a lesser extent of cervical ribs are best explained by errors of bodily segmentation in early embryonic development. These are brought about by abnormal formation of the brachial plexus and blood vessels which make their appearance before the bony skeleton. Examples of posterior fixation of the brachial plexus and abnormalities in the arrangement of the arteries at the thoracic outlet were encountered in 2 of our cases.

3. Symptoms and clinical effects of abnormal first ribs consist of suprascapular bony prominence, irritation or paralysis of the brachial plexus and compression of the subclavian vessel as they cross the defective rib.

6 Cervical arthritis early carcinoma of the thoracic apex and herniation of the lower cervical intervertebral discs must be considered in the differential diagnosis of bra

chial neuralgia even in the presence of an anomalous rib. Malformations of the first thoracic cannot be differentiated clinically from cervical ribs. They can be accurately diagnosed in an anteroposterior x-ray picture which includes all the cervical and uppermost thoracic vertebrae provided the film is taken with a long exposure and the mandible in motion. Under these circumstances the outline of the mandible will be blurred and the vertebra to which the uppermost rib is attached can be identified by counting downward from the base of the skull. Careful scrutiny should also be made to detect associated abnormalities of the second ribs and deformities of any of the other bony structures of the thoracic area.

A considerable proportion of first rib deformities are large enough to cause direct mechanical compression of the nerves and vessel at the thoracic outlet. When symptoms are attributable to this condition conservative orthopedic measures should be tried before surgical intervention. Sclerotomy alone rarely suffices to decompress these structures but must usually be accompanied by radical resection of the rib from a point close to its articulation with the transverse process forward to its attachment to the second rib or where it disappears beneath the clavicle. In cases in which an incomplete removal has been performed through the anterior supraclavicular approach the central end of the rib may still cause irritation of the plexus. Resection of such a stump is then best accomplished through the posterior approach.

8 Our series of malformations of the first thoracic rib now comprises 10 cases. Five of these which required surgical intervention for relief of symptoms are described in detail. We have also reproduced the films from 3 of 5 other asymptomatic cases discovered in the course of radiological examination for other conditions.

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Fig 1: Oscillogram of square wave pulse. The width of the pulse is 5 millisecond and the height is 1 volt.

pective of the time interval between stimuli. With this apparatus we are able to obtain an impulse of rectangular wave shape lasting for as short an interval as 30 microseconds or as long as desired (Fig 1). Thirty three different time intervals selected to conform to a log arithmetic scale were made available. They ranged from period as long as 2 second to one as short as 30 microseconds. The duration of the impulse when measurement of galvanic tetanus was desired was 2 second.

The material consisted of 5 cats in which section and immediate suture of the sciatic nerve were performed and 6 animals in which after a long segment of the sciatic nerve was removed the proximal stump was injected with alcohol to discourage regeneration. In addition many other animals used for other experiments were examined by this method.

The rheobase was determined by finding the threshold value of current when the impulse lasted one second. Then threshold value of current for the production of tetanus were found when an impulse lasting two seconds was used. By shunting the specimen out of the circuit it was possible to observe the ampere in a suitable milliammeter. As much time as was necessary was used and painful unbearable stimuli and severe polarization changes were avoided.

To obtain comparable results it is necessary to examine each muscle by stimulation with an impulse of the same duration. The critical

of the impulse lasting 2 second was made because during denervation the contraction of the muscle is slow and impulses of shorter duration produce contraction the plateau of which lasts too short a time for accurate visual observation. The criterion of tetanus was a plateau representing continued contraction throughout the time of the impulse with very little relaxation—in other words a tetanus for the duration of the impulse.

RESULTS

In the examination for galvanic tetanus one obtains two sets of data. The first: the rheobase or threshold current for instantaneous stimulus of infinite duration using both anodal and cathodal closing stimuli. Second: the threshold ampere at which tetanus is produced and sustained for the duration of the stimulating impulse both for anodal and cathodal stimuli. From these procedures one obtains the tetanus ratio by dividing the rheobase current into the threshold current for tetanus. The data obtained may be interpreted from standpoint of changes in rheobase in threshold current for tetanus and tetanus ratio.

THE RHEOBASE

The liminal current necessary for effective cathodal closing stimulus in the normal muscle of the cat ranges from 0.45 to 1 milliampere.

A small initial rise in rheobase occurred at varying days usually from 6 to 14 after section and suture of a nerve and continued for a short time usually a few days. After 2 weeks or little more the threshold for stimulus diminished and the muscle appeared hyperirritable to direct current stimuli of infinite duration. After the third week the median value of liminal current necessary for effective stimulus of gastrocnemius or tibialis anticus is well below the normal rheobase value and is close to 0 milliampere. Although below the normal rheobase value unipolar stimulation required more ampere for adequate stimulus. Thus regardless of polarity the liminal current necessary to stimulate muscle after the third week is significantly less than the normal rheobase.

Following this initial period the muscle becomes completely denervated. Throughout

this time the liminal current necessary for adequate stimulus is very small for bipolar stimulation it may be as low as 0.1 milliamperes and for unipolar stimulation as low as 0.3 milliamperes. When after section regeneration was encouraged by injecting the severed ends of a nerve with absolute alcohol this hyperirritable state continued for 346 days and the rheobase was 0.2 milliamperes for cathodal and also 0.2 milliamperes for anodal closing stimulus. Thus it may be said that the ratio between the threshold milliamperage for anodal and cathodal closing stimuli is at unity.

Forty or 50 days after primary suture there is a gradual more often a sudden increase in the effective current and after the 6th day the current may have doubled or trebled its previous value. Unipolar stimulation accentuates this change. Between the 40th and 50th day the average liminal median current in another series of animals was 1.8 milliamperes at the 50th to 60th day it suddenly rose to 4 milliamperes. After this day in many instances contraction did not occur even at 5 milliamperes. Higher values of current result in so much spread to adjacent muscles as to make the examination equivocal.

Soon after or at a time coincident with the sudden increase of liminal amperage clinical signs of recovery may be found. The liminal amperage remains high long after recovery of motion and sensation. It begins to diminish significantly at 120 days but still remains higher than normal rheobase after 240 days.

We have confirmed in man the changes here described in the cat. The normal rheobase in man varies as to the muscle examined for flexor sublimis digitorum it is about 1.2 milliamperes for the tibialis anticus 6 milliamperes.

During a state of denervation the order of liminal amperage is about one half of the normal rheobase. As neurotization occurs and recovery progresses the necessary amperage may rise from 11 to 40 milliamperes or more (Fig. 2).

CHANGES IN THRESHOLD AMPERAGE AND IN TETANUS RATIO

During the early part of denervation after severe injury to a nerve and during a long period of time during regeneration after denervation

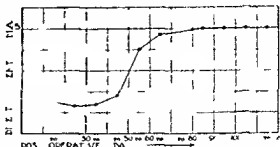


Fig. 3. A graph milliamperes necessary to produce contraction by polarizing stimulus in the heel base at the 50th day post operation.

tion changes in the threshold for galvanic tetanus resemble those for denervation. In each there is a rise more marked during the state of regeneration. During the state of denervation the threshold is at its minimum.

After section of a nerve the threshold amperage for galvanic tetanus rises. Then shortly thereafter at 6 days it rises considerably. At a later period after 14 days it rises to a lesser degree. The peak of this rise is found to occur at from the 6th to the 8th day after which it begins to diminish from the 21st to the 35th day until the state of denervation is reached. The average threshold amperage for tetanus at its peak is 3.9 milliamperes for cathodal closing stimulus with a range of from 1.4 to 5 milliamperes—an average of 5.82 milliamperes for anodal closing stimulus with a range of from 3 to 10 milliamperes.

During the state of denervation the threshold amperage is at its lowest reaching this point at an average of 42 days with a range of from 37 to 49 days and the polar ratio approaches unity.

At the peak of regeneration the average threshold amperage is over 14.8 milliamperes for cathodal closing stimulus with a range of from 2 to 7 milliamperes and over 13.7 milliamperes for anodal closing stimulus with a range of from 3.8 to 27 milliamperes.

The threshold amperage begins to rise from its minimal value during the state of denervation at from 4 to 52 days after suture and reaches its peak in from 52 to 60 days (Fig. 3).

THE CHANGES IN TETANUS RATIO

As is the case with threshold amperage so with tetanus ratio the changes during some

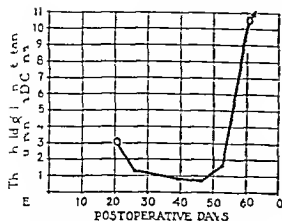


Fig 3 Changes in threshold current (in mA) after primary nerve transection

part of degeneration and throughout regeneration are similar and consist of a much greater rise in the ratio during the period of regeneration. During denervation the ratio is at its minimum, often at unity, both in the case of anodal and cathodal closing stimuli.

Beginning at the same time after suture as rise in threshold and reaching its peak at the same time the average tetanus ratio during the process of degeneration is 8.7 for cathodal closing stimulus with a range of from 3 to 18 and 9.6 for anodal closing stimulus with a range of from 5 to 15.

During denervation the ratio is at its lowest, often reaching unity. The average ratio for cathodal closing stimulus is 1.56 with a range of from 1 to 3 and for anodal closing stimulus 1.8 with a range of from 1 to 1.8. There is no doubt in our minds that at some time during denervation unity is reached in every case, both for anodal and cathodal closing stimuli. This indeed was true of all animals which were denervated and the unity persisted for over 300 days. After a suture when regeneration is proceeding the exact time at which complete denervation may be present for a few days before neurotization occurs may not coincide with the time an electrical examination is made.

During the regeneration the peak of the average of the tetanus ratio was over 15 in the case of cathodal closing stimuli and over 13 for anodal closing stimuli. Because at the same time the rheobase was elevated it was

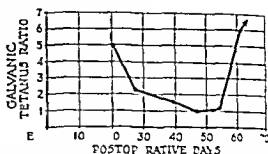


Fig 4 Changes in galvanic tetanus ratio after primary nerve transection

often impossible to obtain tetanus with amounts of current which the animal would tolerate without tumultuous struggling. The range of the average of the peak of tetanus ratio was from 3 to over 40 in the case of cathodal closing stimulus and 4 to over 40 in the case of anodal closing stimulus (Fig 4).

During the period of degeneration there is an initial rise in the rheobase, threshold ampere for tetanus and tetanus ratio. The rise in the rheobase is small, that of the threshold ampere for tetanus is usually moderate and there is a large increase in tetanus ratio. These increases are followed by a fall in all until the state of denervation occurs and then the rheobase is at its minimum, as is the threshold ampere for tetanus. The tetanus ratio approaches unity and finally, if regeneration is not too rapid, reaches it both in the case of anodal and cathodal stimuli. With the onset of regeneration there is a larger rise in rheobase, threshold ampere for tetanus and a very large, frequently indeterminate rise in tetanus ratio.

The changes in threshold ampere for tetanus and of tetanus ratio are the same as the changes of threshold ampere for contraction with progressive currents and of ratio of contraction with progressive currents. In the present experiment we have examined the animal both by progressive currents of long duration and for galvanic tetanus. The changes revealed by these two methods of examination were compared and found to be similar. These results may be quickly visualized in Table I. They may also be seen in a graph showing the changes in response to progressive current contraction and rheobase compared with the graph showing the

TABLE I—RESULTS OF EXAMINATIONS

Stimulus	Progressive current	Threshold	Tetanus
Denervation	Initial strength	Initial strength	Initial strength
Recovery	Maximum strength	Maximum strength	Maximum strength
Regeneration	Initial strength	Initial strength	Initial strength
Recovery	Maximum strength	Maximum strength	Maximum strength

change in the threshold current for galvanic tetanus and tetanus ratio at varying days after primary suture (Fig. 5).

In a number of peripheral nerve injuries in man we have confirmed the approach to unity of the tetanus ratio during denervation and its marked rise during regeneration. Moreover in these cases the data derived from examination with stimuli by progressive currents of long duration parallel the changes in tetanus and tetanus ratio.

INTERPRETATION

In the interpretation of the data obtained from examination for galvanic tetanus the time which has elapsed from the date of injury or operation is of considerable importance. When sufficient time has elapsed for complete denervation to have occurred and upon examination one finds a high threshold amperage for tetanus, a high tetanus ratio, and a high rheobase, the nerve is spontaneously recovering.

When a sufficiently long period of time has elapsed after suture for regeneration to have occurred the nerve is not regenerating if the rheobase is minimal, the threshold for galvanic tetanus minimal, and the tetanus ratio approaches unity. This conclusion applies for both anodal and cathodal stimuli. The same conclusion may be reached when these data are obtained at a time when regeneration should be expected when a lesion of a nerve is thought to be spontaneously recoverable.

DISCUSSION

We have called attention to the importance of studying galvanic tetanus resulting from the passage of a strong galvanic current through a muscle apart from other changes in

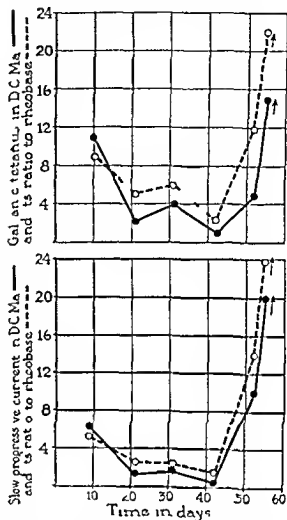


Fig. 5. Change in threshold for galvanic tetanus and tetanus ratio to rheobase after suture of the sciatic nerve in the rat.

the character of the contraction of a muscle. Tetanus results when a galvanic current conveying stronger current than that necessary for liminal stimulus is used. It has been variously called myotonic reaction, galvanotony, and galvanic tetanization. Since it results from galvanic stimulation we propose it be called galvanic tetanus. As the absolute value of the threshold amperage for tetanus may be quite high when the rheobase is high because of changes in the tissues such as edema, etc., it is valuable to estimate the ratio

JUXTACERVICOVAGINAL FISTULA

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FORTUNATELY for suffering womanhood the skill of the obstetrician, gynecologist and radiologist has overcome that the surgery of unusual vesical fistulas has been relegated almost to the limbo of the lost arts through the very lack of opportunity of its practice (except for the occasional gynecologic surgeon who fortuitously has acquired a wide experience in the handling of these cases through being associated with a large clinic and having an especial taste for urological lesions). The exposition of the method of cure of the occasional bizarre case would seem to be justified in order that one so confronted may have the benefit of employing what might be regarded as a procedure which has been standardized at least by the experience of a surgeon who previously has encountered one or more similar unusual anatomical lesions.

Juxtacervicovaginal fistula exemplifies such a rare condition among vesicovaginal fistulas that the spectacle of complete urinary evacuation via the cervical canal is apt to be disconcerting at first glance to one not well accustomed to the handling of the problems of urinary incontinence.

The mode of procedure is rather simple—as are other methods of definite proved value in surgery—and the cardinal principle of the mechanics of fistula repair indelibly identified with Marion Sims—the adequate exposure, closure by suture and catheter drainage—are now as in his time—a *sine qua non* in obtaining a cure especially at one stage.

The distinctive feature of the juxtacervicovaginal or cervicovaginal fistula is the occurrence of a fistulous tract from the bladder to the vagina traversing the cervix uterine junction or being immediately adjacent to it (Figs. 1 and 2). A few generalizations may be made concerning the surgical attack upon vesicovaginal fistulas as a whole. The vaginal approach is without question best from every point of view

if adapted to the anatomical situation but in individual cases exposure may be difficult even with a deep Schuchardt incision. Transvaginal approach as advocated by Young has a definite place in the armamentarium of one dealing with these problems and renders relatively easy the successful outcome in cases difficult by the classical vaginal approach and has been employed successfully by the author in a small series of one stage closures of difficult cases and is particularly well adapted after panhysterectomy. (8) The objection of failure of closure of the suprapubic drainage (Counseller 4) and the scepticism of other authorities (Curtis) do not seem to be justified in condemning this method categorically. Suprapubic drainage with the patient in the prone position on a Bradford type of frame if necessary is quite well tolerated by a patient invariably eager for a cure of her ailment. The prone position is advantageous even without suprapubic drainage. In our hands suprapubic cystostomies have closed at once upon cessation of tube drainage and contraction of the bladder was not a noteworthy consequence. It should also be borne in mind that suprapubic drainage and the prone position practically foreordain a successful result with the healing of the fistula at one attempt and should be considered a essential in dubious cases.

The suggestion of Heaney of insertion of a radium needle of 1.5 milligram and giving a maximum of 250 milligram hour into very small fistulous tract is interesting and granted the dosage were correct for the given caliber of the fistula the rationale seems perfect in view of the complete constricting fibrous reaction of radiation.

Babcock in vesicovaginal fistula, in general traces the proximity of the ureter if fistulas are high almost invariably true in cervicovaginal fistulas.

Graves recommended closure by bladder mobilization and in cases of high fistula of using the abdominal route.

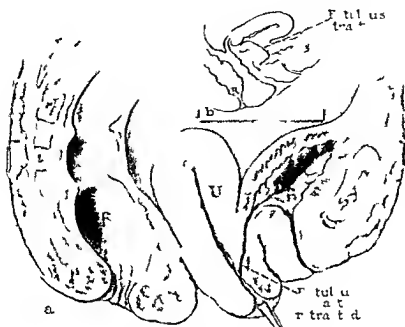


Fig. 1. Lat. 1. fist. tract

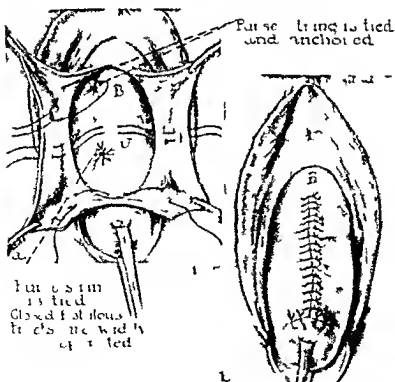


Fig. 2. Lat. 1. fist. tract. The Vessels of the fistula are tied and the tract is closed.

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SUMMARY

The succe sful closure was obtained here by
 wide and free mobilization of the bladd r as a
 preliminary step—really an open se ame to the
 cure of ve cal h tula any where permitting as
 it does suture without tension which almost pre
 supposes and guarantees proper healing dis
 placement of the vesical le ion laterally and
 cephalad under the pubocervical facial edge
 (Fig 3a) a d l lance of 3 to 4 centimeters and
 interpolation of a fascial bulkhead between
 the two fistulous orifices separately closed

It seems advisable to emphasize in compli
 cated fistulas the maintenance for 12 days
 po loperatively of the prone abdominal posi
 tion of the patient coupled with catheter drain
 age Contrary to the expre sed opinion of
 some observers thi position i extremely well
 tolerated by the patient and offers a great in
 crease in the certainty of one stage closures
 Thi position ha been advocated by Clute and
 Young and by thi clinic in a previou ly re
 ported series of 4 l transvesical closures of mac
 ce ble vesicova inal fistulas all followin
 panhysterectomy and all closed succe sfully
 at one operation by the transvesical route

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INTESTINAL INTUBATION IN BOWEL OBSTRUCTION

Technique with a New Single Lumen Mercury Weighted Tube

FRANKLIN HARRIS MD FACS Senior Lecturer

THE history of intestinal intubation and its indications and contraindications in the treatment of bowel obstruction have been so well described (2) that it is not the author's intention in the present communication to dwell at length upon this aspect of the subject. Emphasis is placed rather on methods of intubation, the technique of intubation based upon personal experience with 36 cases of small bowel obstruction in which intubation was used either as the only form of treatment or as preoperative or postoperative therapy.

Wangensteen and Dearing have classified intestinal obstructions into clinical groups showing which are suitable to treatment by (1) *intubation alone* paralytic or adynamic ileus e.g. postoperative or occasionally adhesive ileus (2) *peroperative and postoperative intubation* and (3) *operative and postoperative intubation* strangulating obstruction e.g. mesenteric thrombosis hernia volvulus and intussusception.

It is the opinion of the author that the use of intubation in the treatment of the so-called strangulating type of bowel obstruction. Such cases demand early or immediate surgery and like the nearly always demand postoperative intubation therapy because of the subsequent paralytic type (ileus or partial obstruction which occurs later to newly formed adhesions). In a future report it is hoped to publish details of case histories from the present series illustrating the uses of intubation in the treatment of the various types of bowel obstruction.

Millingtons of the original method of Miller and Abbott have been described in an attempt to pass the tip of the tube rapidly through the pylorus and into the obstructed small bowel. Thus, W. O. Miller and Abbott recently used a wire tipped Lieutenants Henry Mayer described using a electromagnet to place the Miller Abbott tube so that with the use of a magnet applied from against the patient's flank the tube could be drawn through the pylorus under direct

fluoroscopic. H. B. Morton suggested the use of a special tip weighted with lead shots to be added to the Miller Abbott tube. In this respect he is also using the principle of gravity or a heavier weight in an attempt to carry the tube through the pylorus. I have had no personal experience with any of these methods. They all indicate the difficulty of passing an intestinal tube into the small bowel by previously described method.

In a report published after experience with 19 consecutive cases in which successful intubation was carried out by means of a mercury weighted Miller Abbott tube the author (5) demonstrated that the use of metallic mercury in this manner facilitated rapid and certain passage of the tube into the small bowel. It was his belief that this method of using mercury as original however it appears that approximately simultaneously Dr. L. A. Sivertsen of Minneapolis had had the same thought but lacked the clinical material to experiment with this system (11). The only other similar use of mercury in this manner as described by Wilkins in 1935, he used a small amount as a weight in the bucket of a single lumen nasal tube.

Since publication of the preliminary report on the use of mercury in the balloon of the Miller Abbott tube many personal communications have been received from surgeons throughout the world describing enthusiastically their success with this simplified technique of intestinal intubation. With this added confirmation of the successful use of mercury in this manner further clinical studies on the use of a single lumen mercury weighted tube have been carried out as rapidly as material presented itself.

The principle upon which a single lumen mercury weighted intestinal tube is indicated is that a weighted ball carrying the tube into the small bowel by force of gravity in contrast to the principle of peristaltic activity against the intubated end of the Miller Abbott tube. The use of the mercury mold it to the outline of the nasogastric esophagus and pylorus resulting in minimum discomfort and trauma arising from its passage.

There are certain dangers and disadvantages to the use of a single lumen tube as well as to the double lumen tube. The author had a personal experience with

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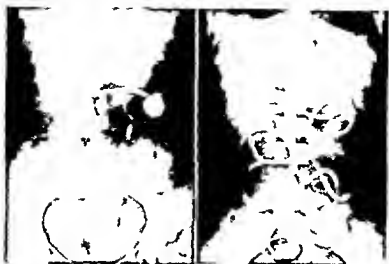


Fig. 5. Case No. 86. This patient had a history of a small intestine obstruction. The tube was inserted into the small intestine and the patient was able to eat and drink. The tube was removed after 24 hours and the patient was discharged.

from 5 to 10 minutes or longer. The upright position and physical activity aid considerably in provoking a more rapid descent of the tube into the duodenum and jejunum.

A minor point of technique which must be emphasized is that of ascertaining that progress of the tube is not restricted by the adhesive tape attached to the cheek. A liberal loop of slack tubing usually 6 to 12 inches should be left between the naris so that the spontaneous descent may be observed and measured carefully by the nurse. The nurse is requested to note on the tubing the inch mark which shows at the external naris immediately after the tube has reached the stomach. She is then told not to allow the tube to move spontaneously or to be helped along at a rate greater than 1 inch every 10 minutes. If the tube appears to be moving too fast this rate is decreased to one inch every 15 or 20 minutes. There is a tendency on the part of the nursing personnel and the house staff to try to hurry the descent of the tube by feeding it into the nasopharynx at too rapid a rate. This not only will result in coil of loop of the tubing in the stomach preventing the ultimate passage of the weighted bag into the small bowel. In most cases with a little patience it will be found that the tube tends to descend by itself.

The advantages of calibrating the tube so that we are able to obtain exact nursing information

concerning the length of tubing which has descended in a given interval. There is considerable variation in the rate of progress. In one patient the tube moved so fast that four feet appeared to be taken into the intestine in less than 8 hours. In other cases there was a tendency for some of the tubing to coil in the stomach itself although the mercury weighted tip had definitely passed into the small bowel. In still another group after fairly rapid passage of approximately 2 feet a day with evidence from the drainage that the obstructed intestine was being decompressed the tube appeared to stop in its progress for perhaps 24 hours at a time. However further progress in such a case seems unnecessary as the purpose of the decompression has been accomplished. It has also been noted that when this tube is used in a nonobstructed case such as in preparation for large bowel surgery it descends so rapidly that a considerable length (8 to 10 feet) may be drawn into the intestine with no further such occurrence can be averted by stopping the passage of the tube at the 4 or 5 foot mark until subsequent flatulency with the x-ray location of the tip.

A final point for emphasis is that the tube is suitable for oral or nasal insertion. The use of the oral or nasal passage must be carefully checked by flat or so-called scintigraphic films of the abdominal taking at frequent intervals. During the first 48 hours of an antenatal intestinal

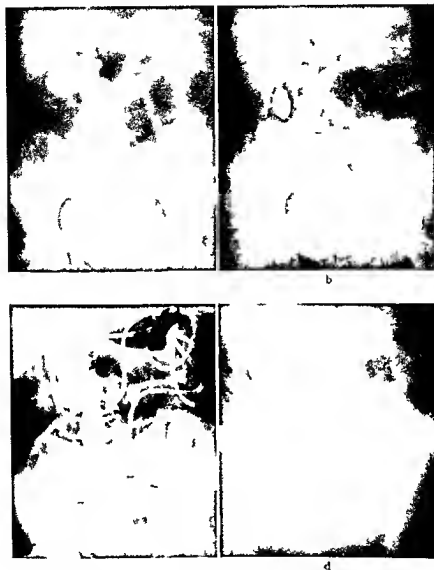
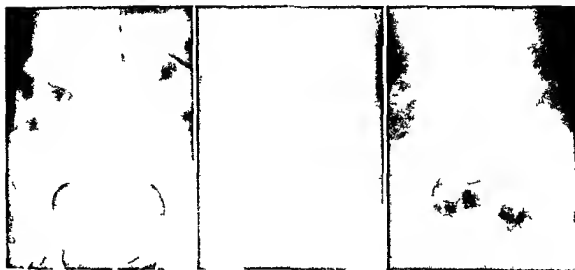


Fig 6 Case No. 74. Film (a) shows the initial state of the patient with a distended bowel. Film (b) shows the tube in place. Film (c) shows the tube further advanced. Film (d) shows the final state with the tube in place and the bowel decompressed.

be treated by intubation at last the films will have been taken approximately 12 to 18 hours apart. If these films show favorable progress of the tube with deflation of the distended intestinal loops the patient may continue to be treated conservatively by intubation alone (Case 1, Fig 5 a, b). If clinically and radiologically the patient is not doing well or if the tube has not made satis-

factory progress the surgeon has not lost too much time in determining that operation is essential (Case 2, Fig 6 a, b, c, d). In either type of case the intestinal tube is not withdrawn until follow-up abdominal films show complete disappearance of any evidence of obstruction.

In treatment by intubation alone of the simple type of intestinal obstruction the tube usually re-



the sperm that be expelled with the distal lumen. Here it remained until it was gradually withdrawn. After it was removed, most of the distal lumen appeared. The post-operative course (Case 1, 6 d).

The perforations in the distal portion of this new tube are large enough to permit of injection through the tubing and disposition within the distal intestine of a fine preparation of light barium mixture. The author is experimenting with this procedure as a further diagnostic aid in intestinal obstruction treated by intubation.

RESULTS

In summarizing the combined clinical experience with the double lumen and new single lumen mercury weighted tubes, we note that intubation has been employed in 36 cases of intestinal obstruction. A detailed analysis of these cases is not attempted in this communication. Suffice it to say that 1 of the 36 required no surgical intervention and were successfully treated by simple intubation without mortality. Of the remaining 25 treated by surgery and intubation there were 6 deaths.

CONCLUSIONS

The use of metallic mercury as a weight to facilitate the passage of a double or single lumen intestinal tube into the small bowel has been carried out in 6 cases of intestinal obstruction with but two failures to accomplish successful intubation. The method now appears to have been successfully used by many other surgeons who report enthusiastically on its advantages.

A new simplified calibrated single lumen mercury weighted tube is described for the purpose of

intestinal intubation. It has the advantages of smaller total diameter, larger drainage lumen, caliber calibration to permit exact recording of the descent of the tube and simplified technique of introduction. It has been successfully used in 15 cases to date.

The importance of frequent x-ray films of the abdomen as an essential part of this technique is stressed.

Accidental rupture of the rubber bag containing the mercury has occurred in 2 cases without evidence of mercurial poisoning.

Successful intubation by means of the mercury weighted technique seems to indicate that the principle of an air inflated bolus to stimulate peristaltic activity is unnecessary for progression of the tube into the obstructed small bowel. Gravity acting on a heavily weighted mercury tip accomplishes this result.

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DEFORMATION OF THE SKULL IN HEAD INJURY

A Study with the Stresscoat Technique

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In a previous communication (3) deformations of the skull of the dog under anesthesia at the time of a blow studied with the aid of the cathode ray oscilloscope were discussed. In this paper we wish to report results obtained by the use of the stresscoat technique (1, 2) to indicate deformations of the skull resulting from hammer blows. If deformations are of sufficient magnitude they cause cracks in a strain sensitive little coating previously applied to the surface of the skull. By this method the resultant deformation patterns in the immediate vicinity of as well as remote from the blow may be studied.

TECHNIQUE

Dogs and monkeys were used in order to establish a correlation between the results obtained in the dry skull of the dead animal with the intracranial contents undisturbed and the skull of the living animal under nembutal anesthesia. Further studies were made on human material consisting of dry skulls and skulls of cadavers from the anatomical laboratories of the University.

In each of 6 dogs the skull was posed after the temporal muscles were dissected away from the bone down to the region of the zygomatic arch. The temporal muscles were then carefully sutured to the upper jaw to keep them out of the way and to minimize the possibility of moisture and soiling in the area under study. The surface of the skull was cleaned by scraping the muscular and fascial attachments and was smoothed by sandpapering. It was then sealed with ether. The preparation was then ready for dressing. In this experiment the details of which are given below, as completed in about 10 hours. Two to three additional injections of nembutal were needed to keep the animal under anesthesia. At the conclusion of the experiment the animal was killed and the same procedure was repeated on the skull to have a further control. The terms were essentially the same as the human material. Later the contents were mailed to the skull was cleaned. In the group of experiments

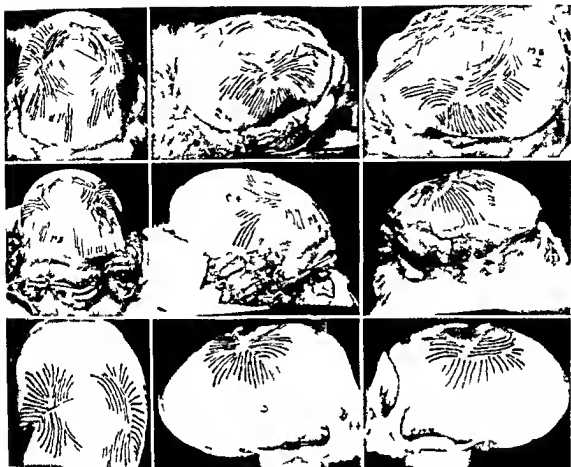
were then carried out on the dry skull to note correlations of pattern. In one macaque monkey a coronal incision was made from ear to ear. The scalp, the small masseter muscles and the deep muscles of the neck reflected so that the skull was exposed from the level of the orbital rim anteriorly to the foramen magnum posteriorly and from zygomatic arch to zygomatic arch laterally. The skin and muscles were sutured to the upper jaw anteriorly to the cheeks laterally and to the neck posteriorly. The strain patterns were studied in the monkey under anesthesia on the skull of the dead animal with contents intact and later on its dry skull. In another monkey (macaque) the strain patterns were studied on the skull of the dead animal with contents intact and later on the dry skull.

Stresscoat is the trade name of a brittle lacquer method of strain determination in any structure subjected to static or dynamic forces. The surface of the structure is coated with a lacquer. Cracks form in this coating when the material to



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taped to the body to insure similar temperature conditions.

bliss were struck with the flat portion of the mallet. The stress-cracked area was then covered with a red dye etchant solution which penetrated all the cracks formed by the blow. When the etchant was removed by an emulsifier solution the red dye remained in the cracks. The dye etchant treatment is necessary because the cracks frequently close so tightly after the blow that they are not visible. In the hanging trial the etchant was removed 40 seconds after its application. In the dry skull it was allowed to remain on the lucifer for about 90 seconds before it was removed with the emulsifier. In the tests on living animals the dye etchant and emulsifier

ver heated to slightly above body temperature before application. The emulsion was washed away with arm tap water in the case of dry skulls and with water heated to slightly above body temperature in the case of tests on animals under anesthesia. The skull was then allowed to

The pattern is best visualized with the aid of a magnifying glass and with proper adjustment of the direction of the light which illuminates it. A permanent record of the cracks are traced with India ink and the skull is then photographed. An untraced reparatation is shown in Figure 1. It must be noted that most untraced reparations would not photograph well because of the fineness of the cracks.



Fig. 3. Strain patterns following a midfrontal blow. The skull is shown from the top. The strain patterns are visible as dark lines radiating from the point of impact. The skull is shown from the side. The strain patterns are visible as dark lines radiating from the point of impact.



strain patterns caused by a given amount of absorbed energy. The effects of a midoccipital blow near the parieto-occipital suture, a midfrontal blow, a midline vertex blow, a blow in the lateral frontal region, and a blow in the lateral posterior parietal region were studied.

Midfrontal blow. A midfrontal blow, as studied on 1 cadaver and 2 dry skulls. A midfrontal blow if sufficiently light may cause only a local deformation at the point of impact. If a strong blow is used, strain patterns appear at the supraorbital ridges and extend down into the roof of the orbit (Fig. 4). Other patterns are noted to course obliquely downward and outward along the lateral aspect of the frontal bone to the pterion. Some extend well into the temporal bone (Fig. 5). A blow applied in the midfrontal region to the left of the midline caused extensive strain patterns as well as a fracture from the border

of the area of impact to the left supraorbital notch. It should be noted that this line of fracture is at right angles to the strain patterns seen on the surface of the skull due to the fact that it was initiated on the internal surface of the skull. Its extension toward the supraorbital notch is explained on the basis that such a notch or foramen represents an area of stress concentration. Simultaneously with strain patterns on the outside of the skull, there are patterns on the inner surface of the skull, and these internal and external patterns meet at right angles to each other. In this structure one also notes the presence of patterns crossing each other. These are produced by the successive deformations of the skull following the blow before the structure comes to rest again.

Midoccipital blow. A midoccipital blow was studied on 2 cadavers and 2 dry skulls. A blow in the midoccipital region near the lambdoid suture causes



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b



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In Figure 6 b and c a fracture line ext rd.
fr m the borde f the area of th bl wt the lar-
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l es f crack n the st esscoat wh ch appeared t

Fig 7. The appearance of the fracture line in the skull of a patient with a lateral temporal bone fracture. The fracture line is visible in the lateral temporal bone, extending from the base of the skull towards the top of the head. The fracture line is labeled 'a' and 'b'.



b



originate in the lamellar suture region and not extend as far as the area of impact. It is probable that the fracture line parallel to the radial arrangement of strain started at the lamellar suture and extended to the area of impact.

Lateral frontal blow. The results of a lateral frontal blow were studied in 12 skulls. In these preparations, the results from the circular arranged cracks in the area of impact were even more strain pattern. The cracks extended toward the temporal fossa. These cracks in the frontal bone and (Fig 7) in the lateral frontal bone and the temporal bone and the malar bone. Cracks can also be seen over the malar bone at the frontoanterior junction.

Lateral posterior parietal blow. These were studied in 12 skulls. After such blows, strain patterns are found to extend from the impact point towards the temporal bone and the parietal bone (Fig 8a). In Figure 8b, a blow to the posterior parietal region resulted in a fracture

line extending from the border of the area of impact to the parietotemporal suture. It is likely that the fracture started at the suture line and extended to the area of the border of the impact. Several parallel cracks in the stresscoat extend not only from the suture line but also from the border of the area of impact.

Middle blows at the vertex. These were studied in 12 skulls. A middle blow at the vertex caused cracks in the stresscoat extending into the temple on both sides (Fig 9). In these skulls, a circular piece of the skull is tensed in the border of the circular piece on the outside as well as on the inside (Fig 10). The skull at the point was very thin and the stress of the impact was immediately over one of the legs of the stresscoat.

OBSERVATIONS

At the outset it should be stated that this particular method of study has certain limitations.



Fig 8. The present study has the following findings from the lateral post-mortem examination of the human skull. The strain patterns are marked with ink lines on the external surface of the skull.

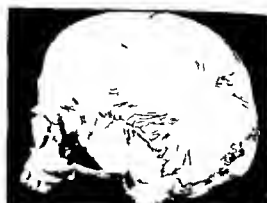


Fig 9. The strain patterns are marked with ink lines on the external surface of the skull. The strain patterns are marked with ink lines on the external surface of the skull.



Fig 10. The strain patterns are marked with ink lines on the external surface of the skull. The strain patterns are marked with ink lines on the external surface of the skull.



Fig 11. The strain patterns are marked with ink lines on the external surface of the skull. The strain patterns are marked with ink lines on the external surface of the skull.

The method shows only tensile strains. In these tests we have studied the behavior of the outside surface of the skull only and have no information on what occurs on the internal surface of the skull. This is important since following severe blows tensile strain may be greater on the internal surface of the skull. The method necessitates the removal of the skin and muscles so that the effect on deformations of the skull cannot be determined. However, it has been proved that the contents of the skull have practically no effect on the tensile strains. It is permissible to deduce that the removal of the skin and muscles from the exterior of the skull would be of minimal significance if any. In the dry human skull, sutures lines affect to some degree the transference of strain patterns.

The strain propagation characteristics are based on the shape and variations in thickness of the skull. The strain patterns of the human skull are totally different from those of the dog. In the dog, a more extensive pattern was obtained while in the human, the strain patterns of the skull caused discrete areas of involvement as indicated with the lacquer of the strain sensitive used.

In the human skull it was found that the strain patterns followed by strain patterns along the orbital rim extending into the roof of the orbit as well as cracks in the lacquer. The frontotemporal eminence. Clinically fractures involving the roof of the orbit are quite common and in general the fracture line parallels the strain patterns seen in the reparations. With a method

capital blow near the lambdoid suture there were evidences of extensive deformation about the foramen magnum. These strain lines parallel the three types of fracture frequently seen in this region. These are first fracture lines extending from the occipitoparietal region into the lateral aspect of the foramen magnum; second, those extending toward the base just lateral to the foramen; and third, those which end in one of the lateral foramina such as the jugular foramen or may extend further forward toward the petrous bone. Lateral frontal and lateral posterior parietal blows on the skull caused cracks in the lacquer extending to and the temple with the former the direction of the cracks was downward and posteriorly and with the latter downward and anteriorly. The direction of the cracks parallels most fractures in this frontosphenoidotemporal and parietotemporosphenoidal neighborhood.

Although human and lower forms differ in their strain patterns the use of the lower forms to note correlation of results in the animal under anesthesia and in the dry skull is of inestimable value. Strain patterns obtained from live and dead animals and from dried skulls were sufficiently similar to state definitely that the hydrodynamic effect of the contents of the skull in the live or dead animal did not materially change the pattern as obtained from a study of the dry skulls. This does not imply that the magnitude of the strains is the same but that the strain paths are the same. From the foregoing facts it can also be justifiably deduced that the effect of the skin and muscles on the strain pattern is negligible.

A study of the skulls in which a fracture was obtained reveals that this was brought about by tensile strains either on the internal or external surface of the skull. Failure may start on the internal surface of the skull due to the internal bending or it may begin on the external surface as the secondary deformation causes an outflaring of the skull.

Patterns obtained in some preparations clearly indicated that following a blow the skull vibrated before coming to equilibrium at rest. This was shown by the presence of several strain patterns superimposed over one another. From a study of the interrupted or discontinuous lines the order of formation of the pattern can be determined. (Fig. 1) With the muhlmirensis technique the

ray oscilloscope-strain gauge method several in bending and outbending movements were noted following a single blow (3).

In the present paper only the effects of general deformation of the skull caused by blows administered with the flat surface of a ballpeen hammer are discussed. Bullet and other penetrating wounds and blows by the relatively sharp border of blunt objects are not considered. It is agreed that the strain patterns may be given a certain directional character depending upon the area of impact and the velocity of the injuring object. However, it is felt that in head injury associated with general deformation of the skull fractures occur in regions proved to be areas of stress concentration as shown in these studies.

CONCLUSIONS

1. The stresscoat method is admirably suited for the study of deformations of the skull in head injury at the point of impact and in remote regions as well.

2. The results of these experiments indicate that dry bone is quite different in strength and stiffness characteristics than living bone may be used for the determination of paths of strain under dynamic impact and areas of weakness may thus be determined.

3. Deformations of the skull may be more extensive at some distance from the point of the blow than they are in the region of the blow.

4. Deformations at the base of the skull due to a blow on the occiput are of a larger magnitude great enough to set up vasovagal pressure in the region of the brain stem and medulla.

5. When fracture of the bone occurs the failure is due to tensile stress. Failure may start either on the external or the internal surface of the skull.

6. Strain propagation characteristics are dependent upon the shape and variations in thickness of the skull hence some variation may be expected in the strain pattern in different skulls.

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AMPUTATIONS DURING THE WAR AND AFTER

PAUL F. OLSON, M.D., F.A.C.S., Lieutenant Colonel, MC, U.S.N.R.

MILITARY has been added to our knowledge of amputations during the war. Surgical experience has been large and concentrated and more important the surgeon has worked together with the maker of artificial limbs so that prostheses can be more skillfully fitted to amputation stumps and results more efficiently evaluated.

In the past progress in the shaping of amputation stumps has been retarded because the surgeon and the limb maker have not been closely associated. Surgeons perpetuated the practices of their predecessors with little knowledge of what constitutes a stump suitable for a prosthesis. On the other hand limb makers recommended a suitable stump but they did not know how it could be fashioned surgically. The war has overcome this difficulty much to the benefit of the patient. In beginning to either in amputation centers both the surgeon and the limb maker

are advised removed and the stump is left open so that no infection will be enclosed. The general health of the patient usually improves rapidly. A sufficient viable tissue remains a good stump can subsequently be fashioned by a plastic revision.

The preliminary open amputation differs from the old guillotine amputation mainly in the manner in which the skin is dealt with. The healing of the stump can be greatly hastened and the quality of the final result much improved by preserving sufficient skin subsequently to cover the end of the stump. This is accomplished by incising in the skin distal to the point at which the bone is to be severed at a distance equal to one-half of the diameter of the stump. Obviously the diameter of the thigh is considerably greater than that of a wrist but if the cuff of skin is equal to one-half of the diameter of the stump it will suffice eventually to cover the end of that stump. The skin is dissected back and the muscle and bone are secured. From here the procedure may vary. If the contour of the stump is minimal the skin may be provisionally drawn together over the end of the stump by a suture in the midline, the corners being left wide open for drainage. If there is infection the stump is left open and the edges are drawn down by skin traction. Either way the healing of the stump is greatly expedited and at the same time all the advantages of an open amputation are preserved.

Preliminary open amputation. The preliminary open amputation is a modification of the old guillotine amputation with important alterations.

First it should be pointed out that a preliminary open amputation is never by choice carried out through the site of election for the finished amputation. The classical sites of election for flap amputations are well known but the fact cannot be emphasized too strongly that such sites do not apply to open amputation. The object of an open amputation is to remove all of the devitalized tissue and to preserve all of the valuable tissue. The site of election is the effect of the level of demarcation in the world through the most distal point of viable tissue.

The preliminary open amputation is a life saving procedure. The use of which is irreplaceable.

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Second stage. When the stump has healed following an open amputation a distal field has been obtained. Simple plastic procedures often suffice to prepare the stump for a prosthesis. The scar is excised and the lateral prominences are eliminated. Should the available skin be insufficient to permit flap amputation it will be necessary to shorten the stump further, a desirable that may be necessary in cases in which the stump is already too short. If the length of the stump is sufficient for a reamputation at the site of election a flap are laid out and a pedicle is carried out identical with the primary flap amputation which will be discussed. Let it later. However, if the procedure of the distal of the stump must ultimately be covered by skin and not by scar tissue or graft.

Ida t g f k t c t. Skin is elevated and will retract after it is incised. If the skin margins are allowed to become fixed by a scar tissue in the retracted position it will re-

quire months for the end of the stump to epithelialize and then it will be necessary to shorten the stump in order to accomplish a satisfactory closure. For expedite healing and to obtain a good result it is necessary to apply skin traction at the completion of an open amputation and to continue the traction until the stump has healed.

PRIMARY FLAP AMPUTATIONS

Whether the amputation is performed in one stage or in two the final result to be desired is the same and will be discussed at some length together with the technique employed.

Amputations through the foot and ankle. In the foot an amputation through the tarsometatarsal articulations is acceptable although it deprives the patient of the spring in his gait. It is desirable to preserve a long flap of the plantar skin to cover the end of the stump. Of course an amputation more distal is preferable.

Amputations which preserve only the astragalus and the os calcis have important disadvantages. The insertions of the dorsiflexors are lost and the action of the Achilles tendon is unopposed. As a result the function of the ankle is decreased. Also it is difficult to fit such an amputation with a serviceable prosthesis.

The Syme amputation is probably the best in this area. The tibia and fibula are severed just proximal to the ankle joint and the heavy skin of the heel is used as the covering so that an end-bearing stump is obtained. The prosthetic appliance is functionally satisfactory and provides good ankle motion. However it is bulky and a lady who desires a trim ankle would want no part of it.

Amputations below the knee. The best results in this war have been obtained with below the knee amputations. The employment of a debarring prosthesis permits the patients to bear weight on their stumps for long periods of time. The mechanical ankle joint closely reproduces the original and plastic materials permit the limb to be light yet strong. If the patient has lost only one leg he may walk with a limp that is all but undetectable. Patients with both legs off below the knee walk and even do the intricate modern dance surprisingly well.

There are two mechanical facts to be considered in every amputation stump: the lever and the muscles which motivate that lever. Below the knee the stump is controlled by the quadriceps and hamstring muscles which insert into the proximal end of the tibia. Beyond that section the stump serves only as a lever and the muscles which are severed at the amputation are no longer functional. Consequently there is no ad-

vantage in a long stump. In fact a long stump will have a poor blood supply at the end which may give trouble later. Also a long stump does not lend itself well to the fitting of a prosthesis. The functional length of the stump is in reality measured from the hamstrings but practically the length of the stump is measured in terms of tibial length. About 6½ inches of tibial length is optimum. Too short a stump will tend to disengage from the bucket of the prosthesis and will restrict the usefulness of the knee.

In performing the amputation the anterior flap is laid out longer than the posterior in order to bring the suture line posterior to the end of the tibia. In the dissection back of the posterior flap the fascia is included with the skin. It is not desirable to include the fascia in the anterior flap as it blends with the periosteum. The tibia and fibula are sawed through at the designated point. The fibula is subsequently shortened an additional 1 inch. By means of an amputation knife the muscles are severed at the same length as the tibia and are beveled somewhat posteriorly. The large vessels are secured and the tourniquet is removed. The nerves are drawn down gently severed and allowed to retract into the soft tissues. The end of a nerve must not be permitted to become adherent in scar tissue as a painful stump may result. The crest of the tibia is beveled to give a well rounded stump. The subcutaneous tissues are approximated with a few interrupted sutures before the skin is closed.

Should the stump be opened after the patient has walked for some time the bone will be found to be covered by a glistening smooth white fibrous tissue over which the skin moves freely. It is important that the suture line be posteriorly to the end of the tibia so that it does not become adherent to the bone. Laterally the incisions should not be carried too high otherwise the blood supply to the central portion of the flaps may be jeopardized. In the event of the muscle it must be remembered that it will retract a little and unless allowance is made the end of the bone will be exposed. The objective is a rounded not a conical stump. The bone should be clothed by muscle laterally but not over the end.

The fibula will ordinarily assume a position posterior as well as lateral to the tibia. It lends resilience to the stump and should be preserved unless it is very short and is abducted so that it punches into the skin on weight bearing. In those infrequent cases in which the fibula is removed it is necessary to smooth off the shelf of the tibia from which it was articulated in order to avoid a pressure point for a debarring prosthesis.

It is a series of jerks and tend to spread to the remainder of the musculature on the side contralateral to the injection. Between the attacks the animal appears ill at ease. It may attempt to prevent the twitching by grasping the involved member with the contralateral forelimb. The clinical unilateral attacks may last from a few seconds to a few minutes gradually or suddenly decreasing and stopping. Frequently after several such attacks the fit extends to the opposite side of the body and all four extremities become involved in the clonic seizure. During the convulsion the animal may continue to grasp the bars of the cage and may resist any attempt to catch it. However both during and after the fit the animal appears fixed and confused. These general clonic attacks may last from a half minute to 6 or 8 minutes. With the latter attack consciousness is lost and for 2 to 3 minutes after the fit the animal is unconscious. As consciousness returns the myoclonic twitches begin to appear in the extremities contralateral to the site of injection but rapidly predominate to the entire body. Such general convulsive attacks may last for over 7 hours.

Rarely a few minutes after the intracortical injection of penicillin a monkey will have a tonic clonic convulsive seizure without a focal beginning. Such attacks have been observed only on 2 or 3 occasions in series of over 100 experiments. On no occasion such a generalized seizure was observed 2 hours after the injection without premonitory signs.

For the purpose of this study we have classified the attacks as unilateral or local, tonic or clonic, or major convulsions depending upon the extent of involvement of the musculature. We do not imply in so far as the convulsive action of the penicillin is concerned that the unilateral fit is any less important than the general fit.

CONVULSIVE THRESHOLD FOR PENICILLIN IN THE MONKEY

In a previous paper we have reported the convulsive threshold for the first group of monkeys in this series (6). As further confirmation of the previous studies and as a basis for further study the convulsive threshold was determined in the second group of 10 monkeys. Commercial penicillin dissolved in normal saline was injected into the second right anterior burr holes (electroencephalic cortex) with varying concentrations of 10, 20, 40, 80, 160, 320, 640, 1280, 2560, 5120, 10240, 20480, 40960, 81920, 163840, 327680, 655360, 1310720, 2621440, 5242880, 10485760, 20971520, 41943040, 83886080, 167772160, 335544320, 671088640, 1342177280, 2684354560, 5368709120, 10737418240, 21474836480, 42949672960, 85899345920, 171798691840, 343597383680, 687194767360, 1374389534720, 2748779069440, 5497558138880, 10995116277760, 21990232555520, 43980465111040, 87960930222080, 175921860444160, 351843720888320, 703687441776640, 1407374883553280, 2814749767106560, 5629499534213120, 11258999068426240, 22517998136852480, 45035996273704960, 90071992547409920, 180143985094819840, 360287970189639680, 720575940379279360, 1441151880758558720, 2882303761517117440, 5764607523034234880, 11529215046068469760, 23058430092136939520, 46116860184273879040, 92233720368547758080, 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PENICILLIN CONVULSIONS

The Convulsive Effects of Penicillin Applied to the Cerebral Cortex of Monkey and Man

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ALTHOUGH parenteral administration of penicillin in large doses is accompanied by few or no reactions such amounts applied to the central nervous system may cause serious sequelae. Intracerebral, intracisternal, intracortical, and subdural injection of penicillin in man, monkey, dog, cat, and mice may induce convulsive manifestations, status epilepticus, and in some cases death (6). In order to study these phenomena in greater detail a series of experiments have been carried out in the macaque monkey.

EXPERIMENTAL METHODS

Animals. This study was carried out on a series of 6 immature monkeys (*Macaca mulatta*). In one group of 10 monkeys under nembutal anesthesia 2 burr holes were placed on each side of the calvaria approximately 1.5 centimeters from the midline. The anterior hole lay over the premotor area and the posterior one over the postcentral region. In a second group of 10 monkeys 4 burr holes were placed in the skull on each side approximately 1.5 centimeters from the midline. The anterior hole was near the rostral extremity of the superior limb of the inferior precentral sulcus. The second burr hole was over the central sulcus near the junction of the arm and leg areas. The third hole was over the gyrus between the intraparietal and superior temporal sulci—the anterior marginal gyrus—and the fourth over the striate cortex just posterior to the sylvian fissure (Fig. 1). After the wounds were healed penicillin in varying concentrations dissolved in 0.1 to 0.5 cubic centimeter of normal saline was injected through these holes into the cerebral cortex by a hypodermic needle. Following the injection on the animals were observed continuously for at least 1 hour by two observers and at interval thereafter for 5 to 6 hours.

Penicillin. The penicillin was provided by the Office of Scientific Research and Development from supplies assigned by the Committee on Medical Research for experimental investigations recommended by the Committee on Chemotherapy and Other Agents of the National Research Council. Commercial penicillin made by 10 different manufacturers in the forms of sodium and calcium penicillin has been used in all specimens giving similar results. Crystalline penicillin was the purified preparation containing 1,677 Oxford units per milligram of penicillin.

The antibiotic potency of the penicillin was determined by a modification of the agar dilution method suggested by Fleming. The strength of all penicillin solutions used was tested and considerable variation from the stated potency was found in some specimens. The determinations were usually run in duplicate or triplicate.

EFFECT OF INTRACORTICAL INJECTION OF PENICILLIN

The intracortical injection of 0.05 cubic centimeter of a solution containing 2,000 Oxford units of penicillin is followed by a characteristic sequence of events. Within 5 minutes the animal appears listless and becomes less active than normal. Then myoclonic jerks of the extremities or face contralateral to the side of injection appear. If the injection is made in the frontal eye or striate area, convulsive movements of the head, neck, and eyes occur, and the animal tends to circle with his body as the axis. If the penicillin is applied to the motor area, twitchings of the upper or lower extremities appear. At first the myoclonic movements are infrequent, occurring every minute or two, but they gradually become more frequent. The type of movement is not constant; generally flexion of the extremity predominates, the distal part being most prominent, but at times extension or abduction predominates. Usually, however, the movement is stereotyped, and its pattern changes only with the different muscular components. After 10 to 15 minutes the individual myoclonic twitches give

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The work described in this paper was done in co-operation and under contract recommended by the Committee on Medical Research, between the Office of Scientific Research and Development and the University of Chicago.

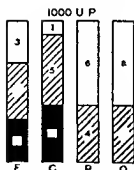


Fig. 3. Effect of boiling on penicillin potency. The chart shows the effect of boiling on penicillin potency. The bars represent the calculated potency of the penicillin solution after boiling for 30 minutes in a water bath. The bars are labeled F, G, P, and O. The segments are labeled with numbers: F (3, 5, 4), G (3, 5, 4), P (6, 4, 0), and O (8, 0, 0).

In these two sets of experiments the convulsive responses are precisely what would be expected if the antibiotic factor were the same as the convulsive factor. The two factors were diminished proportionately by aging.

Inactivation by boiling. In 3 sets of experiments the effect on the convulsive response to boiling of the penicillin solution was determined.

In the first set of experiments the penicillin solution was boiled for 30 minutes in a water bath. Injection of a calculated 1000 Oxford units in each of 10 monkeys produced 1 generalized and 1 unilateral attack. Assays of this penicillin showed its potency to be about 63 per cent of the calculated value.

In a second set of experiments the penicillin was boiled for 1 hour. Injection of a calculated 1000 Oxford units into 10 monkeys induced no convulsive phenomena. Assay of the penicillin solution showed it to be about 10 per cent of its calculated potency.

In the third series the penicillin solution was boiled for 30 minutes in a water bath and subsequently made up to its original volume. Injection of a calculated dosage of 1000 Oxford units of this solution in 9 monkeys produced 4 unilateral fits instead of 2 generalized and 4 unilateral fits as induced by the same calculated dose of untreated penicillin. The penicillin solution on assay was found to have about 10 per cent of its calculated potency (Fig. 5).

In these 3 sets of experiments boiling the penicillin solution caused marked alterations in the antibiotic and convulsive factors. The decrease however was not quite proportional in the third set of experiments the antibiotic factor was decreased more than the convulsive and the reverse being true in the first set of experi-

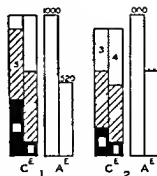


Fig. 4. Effect of autoclaving on penicillin potency. The chart shows the effect of autoclaving on penicillin potency. The bars represent the calculated potency of the penicillin solution after autoclaving for 1 hour at 240 to 250 degrees F. The bars are labeled C1, A1, C2, and A2. The segments are labeled with numbers: C1 (3, 5, 4), A1 (3, 5, 4), C2 (3, 5, 4), and A2 (8, 0, 0).

ments. In the second set the antibiotic and convulsive factors were proportionately decreased.

Inactivation by autoclaving. In 3 series of experiments the penicillin powder was autoclaved for 1 hour at 240 to 250 degrees F. It was then dissolved in normal saline.

In a first series a calculated 1000 Oxford units of penicillin was injected in 10 monkeys and induced 2 unilateral fits. With untreated penicillin in this dosage 4 generalized and 5 unilateral attacks usually resulted. A assay of this autoclaved penicillin showed its potency to be about 10 per cent of its calculated value.

In the second series of experiments a calculated 1000 Oxford units was injected into 10 monkeys inducing 1 unilateral fit instead of the 4 generalized and 5 minor seizures. Assay of the autoclaved penicillin showed its antibiotic potency was about 10 per cent of its calculated value.

In the third series a calculated 1000 Oxford units was injected intracerebrally into 9 monkeys producing 2 major and 3 unilateral fits as compared to 2 major and 4 unilateral seizures with untreated penicillin. Assay of this penicillin showed that its antibacterial potency was 99 per cent destroyed (Fig. 6).

In these 3 experiments the convulsive and antibiotic factors were reduced by autoclaving the penicillin. In the third experiment the antibiotic factor was reduced much more than the convulsive but in the first and second sets of experiment they were proportionately reduced.

Inactivation by elc. In two sets of experiments the penicillin was inactivated by elc. as described by Stanley. Injection of calculated 1000 Oxford unit produced no seizure in either set of experiments and the antibiotic action was found by assay to be reduced more than 99 per

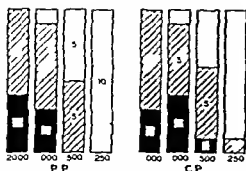


Fig. 3. Histograms showing the convulsive response (generalized fits—solid black; partial twitches—hatched and convulsive manifestations—white) to the intracerebral injection of varying doses of penicillin. PP—partial twitches; CP—convulsive manifestations. The numbers of convulsions in the table are calculated from the results. These abbreviations and symbols are used in Fig. 4.

Effect of site of injection upon convulsive manifestations. Since the electrical excitability of various parts of the cerebral cortex varies it seems probable that the convulsive effect would depend to some degree upon the site of application. This hypothesis was tested by injecting 1000 Oxford units of penicillin dissolved in 0.02 cubic centimeter of normal saline in each of the right burr holes of the second group of monkeys. When the frontal burr holes were injected 3 of the 10 animals had generalized convulsive seizures and 4 developed unilateral attacks. When the injections were made into the motor cortex (second burr hole) 4 major attacks and 5 minor unilateral fits resulted. Injections into the parietal cortex induced only 4 unilateral seizures. When the drug was applied to the striate cortex 4 unilateral fits occurred. It is then obvious that the reactivity of the cerebral cortex to penicillin follows closely the electrical excitability of the cortex. It is apparent that introduction of the drug into the cortex of area 8 and area 4 respectively induces the greater convulsive activity. Application of penicillin to the motor area is perhaps more likely to produce fits than its injection into area 8 (Fig. 3).

The convulsive threshold of monkeys. In a group of 9 monkeys over a period of 2 months 1000 units of penicillin was injected into the cerebral cortex 10 times in each animal. The injections were made through the same burr hole. In any one series of injections however all were made through the same burr hole so that the reactions of the animals are comparable. The

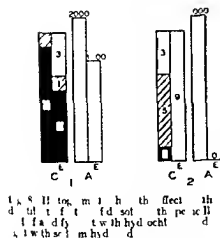
in the first animal half from 3 to 5 seizures from the 10 injections. One animal had 3 major and 4 unilateral attacks. One had 1 unilateral and 2 major fits. There is no apparent correlation between the size or weight of the animal and the convulsive response. While in a large series of experiments the susceptibility of the individual will reveal itself in a test of only one or two injections this susceptibility may not become apparent. Thus in 1 animal generalized epileptic seizures were induced by 500 and 2000 Oxford units injected in the motor region on 2 occasions but on a third occasion 1000 Oxford units injected in the same area produced no clinical convulsive phenomena. Repeated injections through one burr hole will at times decrease the convulsive diathesis so that the same hole cannot be used for more than 10 to 12 injections without its convulsive threshold changing. Probably this increased resistance to a convulsive response is due to scarring in the cerebral cortex and not due to an antipenicillin factor for injection in another site induces fits as before.

CONVULSIVE FACTOR AFTER INACTIVATION OF PENICILLIN

In the hope that the convulsive factor might be separated from the antibiotic factor of penicillin the effect of various methods of inactivation of the penicillin on the convulsive factor was studied. The following are the techniques for inactivation which were employed: aging, autoclaving, boiling, acidification with citric acid and dissolution in alcohol.

Inactivation by aging. Two sets of experiments were carried out with penicillin which had remained in the icebox for some time. In the first series of experiments penicillin which had aged for months was used. A calculated dosage of 1000 Oxford units was injected into each of 10 monkeys. One generalized and 5 unilateral attacks occurred in this series as compared to 4 generalized and 5 unilateral fits when fresh penicillin was used. This penicillin was found to contain 52 per cent of its stated potency so actually the injection had contained only 520 Oxford units.

In the second series a group of 9 monkeys was given penicillin which had remained in the icebox 7 days. An amount equivalent to a calculated dosage of 1000 Oxford units was injected in each animal. Instead of the previous response of 2 major and 4 minor attacks 1 major and 4 minor fits resulted. By assay the penicillin was found to be only 60 per cent potent. The other 9 monkeys injected solution contained only 600 Oxford units (Fig. 4).

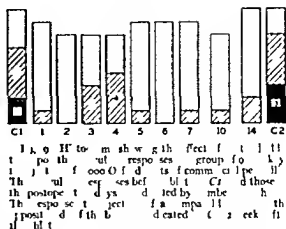


are given in Figure 9. It is obvious that except for the third and fourth postoperative days the convulsive threshold was much higher than that preoperatively. It is therefore inclined to believe that the cellular reaction and inflammatory change about a wound of the cerebral cortex protects it from the convulsive effects of penicillin probably by preventing the diffusion of the drug.

ELECTROENCEPHALOGRAPHIC MANIFESTATIONS OF THE CONVULSIVE EFFECTS OF PENICILLIN

The alterations in the cortical potentials following intracerebral and subdural application of penicillin have been followed by both electroencephalography and electrocorticography. To eliminate artefacts due to muscular activity for the latter type of study the monkeys have been curarized and respiration maintained artificially. This procedure as well as the incision of the scalp has been carried out only after thorough infiltration of the skin by 1 per cent novocain. Small perforations made in the bony calvaria allowed the insertion of screw electrodes so firmly that movement artefacts were eliminated. The electrocorticogram was obtained from needle electrodes inserted in the muscles of the extremities. The amplifiers used for augmenting the electrocorticogram, electroencephalogram and electrocorticogram were two independent electronic amplifiers with direct coupling between the input and output working into a common output.

When the penicillin was injected into the cerebral cortex no detectable change in the electrocorticogram was seen for 15 minutes. Then a few minutes later the site of the injection showed a low amplitude and high frequency activity.



microvolts amplitude began to appear and recurred every few seconds. After 1 to 2 minutes the spikes became coupled and practically synchronous spikes appeared in all leads from the site on which the penicillin had been applied. With small doses of penicillin little abnormal cortical activity was present on the opposite side of the head although with large doses of penicillin (2000 to 10000 Oxford unit) spikes appeared within a few minutes in leads from that side of the calvaria. Spikes increased in frequency and tended to group themselves into runs or bundles of 6 to 8 irregularly paced spikes. These runs increased in length at times lasting for 1 to 2 minutes (Fig. 10). Even such lengthy fits were unaccompanied at times by a distinctly abnormal electrocorticogram on the side opposite the injection. Usually at first the spikes forming a long run would be fairly regular at a frequency of approximately 10 per second. As the attacks increased in frequency and eventually the regularity at the beginning of the seizure became less pronounced and gave way to a disorderly series of large amplitude spikes. Toward the end of a seizure initially there was a tendency for especially large spikes to occur at intervals of approximately 0.5 second. Later this phenomenon would frequently be reversed. At the conclusion of a seizure the cortical activity was markedly diminished. When the attacks had been recurring for an hour or more the cortex was usually inactive for 30 to 40 seconds after the individual fit. Then spikes appeared at first every few seconds but rapidly becoming more frequent and finally occurring almost continuously. As the attack progressed the spikes became of larger amplitude and a greater frequency. After 1 to 2 minutes of high amplitude rapid activity the



Fig. 1. Effect of penicillin on convulsions in three series of experiments. The minimum effective dose of penicillin in these series was 100,000 units.

cent of its calculated value. The convulsive and anticonvulsive factors are obviously about equally reduced by the treatment with chlorase (Fig. 1).

In addition, by the method of dissolving penicillin in alcohol, alcohol decreased its anticonvulsive power. In a series of experiments, an alcohol solution of penicillin calculated to contain 2000 Oxford units was injected into 9 monkeys. Such a dose of untreated commercial penicillin had previously been given to 8 major and 1 minor attack. In this experiment, 3 major attacks and 1 lateral fit occurred. The penicillin was found by assay to have approximately 50 per cent of its calculated potency (Fig. 2).

Acidification of the penicillin by concentrated hydrochloric acid with subsequent neutralization by sodium hydroxide was found to abolish both the anticonvulsive and convulsive factors in 9 series of experiments with 9 monkeys (Fig. 3).

In general, inactivation of the penicillin produced a proportionate decrease of anticonvulsive and

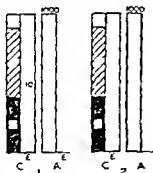


Fig. 2. Effect of penicillin on convulsions in two series of experiments. The minimum effective dose of penicillin in these series was 100,000 units.

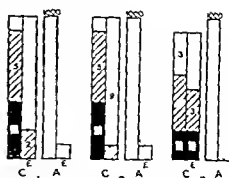


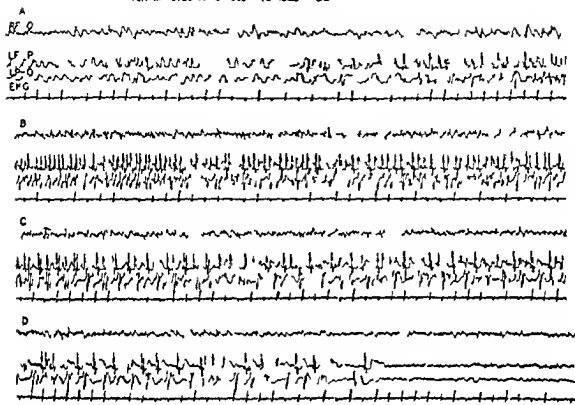
Fig. 3. Effect of penicillin on convulsions in three series of experiments. The minimum effective dose of penicillin in these series was 100,000 units.

convulsive factors. However, the results (auto-claving in one series of experiments and of boiling in other series of experiments) suggests that the two factors may be differentially affected. The more susceptible factor appears to be the anticonvulsive.

INFLUENCE OF THE CONDITION OF THE CEREBRAL CORTX ON THE CONVULSIVE FACTOR

Although penicillin appeared to induce the convulsive state in experimental animals, reports of such complications in clinical use were very infrequent. Even when the drug was instilled into the wound of the cerebral hemispheres, no ill effects developed (4). It seems possible that the lack of convulsive complications in the human cases might be due to the fact that the drug has been administered in abnormal and frequently sclerotic tissue. Also, we had observed that if the cerebral cortex was destroyed by the injection of formalin (a more usual 37 per cent formaldehyde) subsequent injection of penicillin even in very large doses did not induce fits. To test this hypothesis, we determined the convulsive effect of the first series of 9 animals. Intracerebral injection of 1000 Oxford units of penicillin was operated upon each of the animals. The removed cerebral cortex beneath the incision was placed in small petri dishes in the refrigerator. Injected penicillin was injected into the burr holes each day for the first 14 days. The results of the first series of 9 animals are shown in Table I. At the conclusion of this experiment, the cerebral cortex was removed from the excised brain of each animal with 1000 Oxford units of penicillin. The results of these experiments

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seen in the electroencephalogram were manifested clinically by the twitches or jerk of the extremities. When the spikes become continuous the contralateral extremities exhibit a clonic seizure stopping when the spikes cease. When the spikes appear on both sides of the calvaria the seizure becomes generalized. Again the bilateral discrete spikes are associated with twitching of the extremities and when they become continuous clinically a clonic seizure occurs. Following the generalized attack the inactivity of the cortical potentials corresponds to the postepileptic stupor or coma. As the cortical activity reappears the animal begins to regain consciousness.

It is frequently followed by a unilateral attack of paralysis of the involved limb or limbs (Todd's paralysis) is noted. The condition has an electroencephalographic correlate in the diminished or absent cortical activity in the opposite motor area. When the unilateral attacks are frequent both the paralysis and decreased cortical activity

may persist for hours. As a corollary the activity of the cortex at the site of injection and of the contralateral extremities may be less during a major or generalized attack than that of the opposite cortex and ipsilateral extremities.

DISCUSSION

It was thought possible that the convulsive manifestations produced by the application of penicillin to the cerebral cortex might be due to impurities in the commercial penicillin. However, as more and more commercial preparations were tested and all gave predictable results, and as the various methods of inactivation in general affected the antibiotic and convulsive factors approximately proportionately, it seemed more likely that the penicillin itself was the responsible factor. When pure crystalline penicillin was available to show this thesis was proved correct. The precise nature of the chemical reactions involved remains to be determined.

tration of the drug in the subarachnoid fluid over the brain probably much less.

The systemic administration of penicillin even in large doses rarely causes appreciable amounts of the drug to reach the spinal fluid. It is true that in some cases the administration of penicillin may alter the electroencephalogram (7) however we know of no instance in which a fit has taken place.

The local application of penicillin to the cerebral cortex and its injection in cerebral abscesses has been practiced without apparent adverse effect. Since a layer of scar tissue or a pyogenic membrane prevents the rapid absorption of penicillin the likelihood of convulsive manifestations would seem minimal. It is noteworthy that the penicillin may remain in brain abscess cavities for many days without apparent ill effect.

SUMMARY

Penicillin may induce convulsions in monkey and man when applied to the cerebral cortex. The effect is not due to impurities since crystalline

penicillin causes the same effect in equivalent doses. The convulsive threshold is lowest in the motor area, higher in the premotor and frontal regions and highest in the occipital and parietal cortex. Inactivation of the penicillin usually affects the convulsive and antibiotic factors proportionately but a few exceptions have been found. Electroencephalographic manifestations accompany and may be correlated with the clinical convulsion.

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REVIEWS OF NEW BOOKS

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The general character of the book has not been
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and well educated doctors to the care of the wounded in this war. It is obvious that line Army officers that is to say the general staff of the Army are again making it difficult for the Medical Department to implement a policy which the Navy promptly effects because the Bureau of Medicine and Surgery has independence of action regarding purely medical matters. The Navy apparently is aware that young doctors must be attracted to its service by the educational and professional opportunities which it offers and that legislation and

regimentation can never accomplish the result which they desire.

Section 4 of War Department Circular No. 10 April 18 1943 accomplishes nothing except a restatement of existing conditions. Whatever the purpose of the issuance of this circular the civilian medical profession should recognize that it solves none of the difficulties under which they served the Medical Department of the United States Army during World War II.

LOYAL DAVIS

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SURGERY OF BLOOD AND LYMPH SYSTEMS

Blood Vessels

BLAIR, A. H. Dissecting A. rth. An. rym. I. I.
 ing. R. nal. Art. ry. and. C. m. lating. Acute
 Nephrothiasis
 ST. JOHN, F. B. Seco. J. nd. S. rve. D. L.
 Spo. tano. R. ptur. fth. An. lary. A. rry.
 N. THWAY, R. O. and BRER, R. W. Ligatu. f
 th. I. f. no. V. na. Ca.
 K. E. H. M. d. BERMA, F. Ligatu. fth. I.
 f. n. V. Ca. f. P. um. Th. mboph.
 b. is.
 L. T. C. F. B. C. H. I. H. do. F. J. I.
 tracr. al. An. iography.

Blood Transfusion

LAARO, C. G. Eom. oph. u. th. Chr. m. Pen.
 t. nu.
 PRITCHARD, C. L. and FLEW, L. d. P. I. J. m. t.
 ofth. Gen. iour. nary. T. t. Leo. emia.
 RAPPAPORT, E. M. H. pat. u. ft. Trans. f. uo.
 MILLER, E. B. and TRILL, L. H. R. act. n. s. t.
 Plasm. Transfus.
 D. VIDRO, C. S. and L. x. o. S. M. Cal. Graft.
 ing. in. H. m. ph. i.

Rechenloothial Syt m

CARR, J. L. Status Thym. colymphat

Lymph Glands and Lymphatic V. s. l

WARREN, S. Th. Th. rap. u. Use. f. R. d. i. u.
 Phosphoru.

SURGICAL TECHNIQUE

War Surg ry

PARKES, A. R. Traumat. Isch. mia. fth. P. nph. ral.
 N. rves. with. Som. Observat. n. s. V. l. man.
 Ischemic Co. tract. re.
 P. LOCK, L. J. GOLSETH, J. G. An. A. J.
 SHERMA, I. C. SCHILLER, M. A. and T.
 E. L. Th. Rea. u. I. Dege. ratio. in. Electro.
 diagnosis. f. Experim. tal. P. nph. ral. N. r.
 Les. n. s.
 McLAUGHLIN, C. R. Lymph. o. rran. f. ma. Ingu. nal.
 in. Th. R. yal. Air. F. re.
 BERSTEIN, H. G. G. CLARK, J. M. I. and T.
 RIDGE, R. E. Acute An. no. P. Loo. y. u. s.
 among. Service. P. rson. n. f. in. Malta.

45 A. t. T. I. re. o. A. i. C. U. r. C. i. e. n.
 46 no. H. J. Th. I. l. o. m. y. i. f. p. d. m. M.
 486 94. 3
 HALL, C. W. and C. A. I. Pre. ent. of. Se.
 less. A. u. l. t. Craft.
 486 W. C. P. C. Effect. f. l. i. r. w. t. F. p. l. w. n.
 onth. M. m. B. dy.
 487 We. r. J. P. Chest. W. ds. B. t. l. Cas. h.
 W. l. x. so. L. H. d. B. H. A. K. I. es.
 in. Sold. r. s.
 C. W. x. G. R. d. B. r. F. Th. T. ry. f.
 D. D. T.
 B. c. r. e. H. K. Prepara. t. f. B. t. l. Cas. h. e. f.
 S. r. r. y.

483 Operati. Surg. ry. and. Techniq. e. Po. to. perati. v.
 Tr. time. f.

480 D. T. o. C. S. d. L. x. so. S. M. Sk. C. ft.
 g. H. m. p.

400 M. T. r. u. e. D. N. St. r. s. of. Sk. f. A. tog. u.
 Grafts.

400 STURM, M. M. and H. d. C. C. I. Human.
 b. Graft.

7 F. M. x. U. W. d. Wool. l. o. r. s. F. M. Res. f. c. g.
 f. D. r. u. m. fth. H. d. f. l. g. B. r. s.

5 Pic. J. F. D. m. o. plasty. f. W. W. u. d. fth.
 Low. Leg.

46 P. C. K. G. T. SCHAR. EL. I. d. M. r. i. t. M. Th.
 P. n. c. p. l. f. Ex. u. s. d. d. D. i. s. s. e. u. C. t.
 ty. f. P. r. m. ry. d. M. t. a. s. t. a. u. M. l. a. r. o. m. s. f.
 th. Sk. s.

478 WAR. E. H. D. B. L. E. V. G. ROG. L. A. O. F. T.
 and. F. P. A. h. o. k. A. t. i. f. f. t. n. s.

49 J. C. M. R. J. Operat. f. A. l. f. t. h. S. m.
 Reasons. f. Fail. r. s.

500 An. h. p. h. Surg. ry. T. a. t. m. n. t. f. W. o. u. d. d. l.
 f. h. s.

423 L. M. C. R. d. P. a. r. a. m. M. Th. I. y. r. u.
 Acid. M. th. o. d. f. B. S. i. h. k. o. l.

M. I. N. T. O. S. H. J. R. R. H. M. S. S. i. s. t. e. f. P.
 R. E. O. J. f. i. and. O. r. t. h. r. s. A. r. i. d. i. f. n. a. m. i.
 Com. p. o. u. n. d. as. W. o. u. d. A. n. t. i. s. e. p. t. i. c. s. (L. h. u.)
 T. r. a. s. f. E. l. a. z. o. l.

5 MAC. A. L. A. x. M. G. F. a. l. t. y. f. G. G. g. in.
 R. l. a. u. to. T. r. a. t. m. t.

55 S. P. O. T. T. Y. S. D. and. D. V. S. J. B. A. l. a. r. u. b. E. a. n. l. a.
 m. u. d. O. r. t. m. t. S. g. r. y.

An. the. s. a

4 A. D. o. S. G. J. d. H. d. o. C. W. f. e. n. c.
 with. Co. t. n. s. C. al. Analges. O. b. a. t. u. c.
 t. th. U. n. i. v. r. s. i. t. y. f. M. h. g. a. H. o. s. p. i. t. a. l. An.
 Ar. b. o.

PHYSICO-CHEMICAL METHODS IN SURGERY

Roentge. logy

450 F. P. E. L. M. H. and. H. A. S. T. O. b. T. In. u. s. u. a. l. p.
 t. i. o. n. fth. St. m. a. ch.

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- Abbott W F 5
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 A " A J 4
 At t J S 5
 Ayre J E 4
 B lbo A G 3
 Bang J A 7
 Barre R H 4 3
 B r E C 5
 B t l A E 437
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 B chwald K W 475
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 C rate O 4 3
 C r r G 4
 C land J G 4
 G lock J H 400
 C t ood I T 4
 Ge ban M J 4
 G n I 45
 G elsh J G 4
 Grant F C 5 4
 G L C J 46
 C gory R 5 9
 G est A I 49
 H c L R 47
 H ged m D 5
 H gal G E 45 433
 Har H F 432
 Haro k J 407
 Harro T R 4 9
 Harro T L 440
 H tch M B 440
 H y es G S 445
 H d rso C W 500
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 Hesselt H C 4
 H bl D K 4
 H l l G W 49
 Hod C C 5
 H od r e F J
 H u e a l R W 4
 H lls L 5 3
 H dso L 475
 H hes R K 3
 H r thal L M 6
 I l l C J J 45
 I t z N S 4 3
 J km K J 04
 J r o bso C I J 4
 J a u H L 08
 J h e o L F 442
 Josey A I 9
 Keam P J
 K m H M 400
 Ka by D B 44
 K r s m x F E 4 9
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 Lam C R 04
 Lawso R S 463
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 Le r G C 450
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 L y C D 4 3
 L C F 5
 M f l m M G 5
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 M thers D N 500
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 M a x w H K J C 456
 M Cartney H D 44
 M Cl re G W 4
 M G c k T H 5 6
 M Grego I S 447
 M l tosh J 504
 M c l a g h u C R 430
 M j M R R 4
 M i k D W 46
 M y F L 30
 M l l F B 49
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 M t e M 5
 M r o y P B 433
 Mus l n S 6
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 N rthw F R O 49
 O b e A M 40
 O N H J F 4 3
 O rth O S 460
 I k G T 50
 P l m L J 473
 P rkes A R 451
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 P r a t t T h o m a s H R 4 3
 P u p p e n d h l M 504
 P y l H D 442
 Q u i n l a n W S 4 9
 Q u a n n R 473
 R a b u s B 445
 R a d e r L 503
 R a u d M B 445
 R a n d a l l G C 434
 R a k P 5 3
 R a p p a p o t L M 49
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 R i h a r d s o n J K
 R b rso H C 5
 R o k s o R H M 524
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 R o s e E M 4 3
 R o s h k 503
 R c k k F 5
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 I J h t H 48
 S a m m J J 4 3
 S c h m a g e l I 4
 S c h l M A 4 1
 S c h m d r E K 4
 S c h t k M T 41
 S c u d l J 48
 S e d d H J 48
 S e b t k 5 4
 S v n g h A F L 5
 S h a l J 457
 S h a l l b e r g P L 45
 S h r m I C 41
 S h r m M S 453
 S g a l S 46
 S r m W A 45
 S r l y A 4 4
 S o u d r s C K 5 4
 S p e e d J S 45
 S p e I S J 44
 S p o t t S D 5
 S t n u M W 41
 S t r e D L 45
 S t w t F W 45
 S t f U E 5
 S t t A P 5 3
 S t r u m a M M 5
 S t r H H 45 4 9
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 T r y T L 445
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 T r a y F L 41
 T i n S W S 45
 T o d l l H 49
 T m l s o W J 5 3
 T r p R 4
 T r a C A 45
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 V o m J 4 4
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 W l k K M 4 4
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 W a r r H D 5 3
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 W g h W G 49
 W t L 442
 W e s t J I 4 7
 W h a t c r F F 4
 W l l m R L 40
 W l h m S t 4 7
 W l k s o n L H 4 5
 W i l s o n A J 5 9
 W o o d r y K A 4
 W o r t h s e F M 5
 Z a o d A 457
 Z o d k H 44
 Report (L Sec 1 4
 W S rvey (N u A
 p e n a t s M o r t a l y 4

pasm as p t h h to be th onl cau f th
chemic d g crati in th n ve tru ks lor the
nly way in which this could h ppen o ld be by
xtens on of th a t rial pas m t the remon l vasa
n rorum Lewis and thers showed that a pressure
as low s from 60 t o mm Hg wa uffic ient to
block conductio n the nerve trunks and that th
block w s du to ischemia In most of the cases
under discuss on th re was a history of gr s swell
i g f th limb nd a d layed app arance of a per
p eral nerve inj ry furth r the nerves ly ng
outs de f the de p fascia of the limb oft n escaped
which suggested that the presu r of fluid exud te
and extra asated blood beneath th fa cia produced
condit ions similar to th se in Lewis xperiments
It w s suggested that th pressur he cath th deep
fascia plus the general an xi of the limb plu pos
sible th ombos s in the veins and capillaries of the
nerves ll in olvi g a considerable length of the
trunks w s sufficient to abol sh conducti n and to
produce th clin cal picture d scr b d This may be
secured by m cha cal direct injury to one r more
nerves

Recovery w s slow and depe d nt n regenera
tion Tre tment con st d of form g a collateral
circulat n by h ting the unaff cted limbs oxygen
therapy the inject ion of ant pasmolics such as
p pa rin para ert bral and intratracheal j ct ns
f n can p ri eterial sympathectomy nd pos
sibly arteriect m Th u e of clo d plast r in th
p nce of swell g was r garded as p rticularly
d n c o s

The n tom cal nomencl t r mploy d ma
at some confusi n unless the reader has eco re
to a gloss ary of th arno s names g e t th
n rves of th l and foot

ANDRE VER ROGHE MD

BRAIN AND ITS COVERINGS CRANIAL NERVES

Krem r M Phillips C G s d St nler M W
The D trib ti n of Sulfamerazine In the
Body Fl id th R l ion t Cran l l J ries
L r Lo d 945 243 495

Th lf drugs and espec lly sulfadiaz e a
l l po t a b t xent to co trol tracrati
f ct In t v r s s ll ad az e has be n u d
l rgely i co trol g th nfecti n l k ly to follo
p n trat n f the dura b m les or by c mpound
fract es Th easo f th that e c p f r
ulf n lam d ll d r aches t r r b o
p n l flu d the b hest co centrati o th c r
bross all fl lb g between 60 and 80 p c t
f that f th blood l l Howe r i the h gh
blood and pi s l f c trations neces ry l
fects etherap exalizations ptt occu th
n ry tract h h m t r r f c l l r u
de n s p p e f th rin with urem Th
te c v t r i exal tiazat is cccntu ted b
th occas al ecessity f h drat g th gate t
M m th l s ll d a r a d d m th l l d

ure d a bee tried with r gard t th te
nt of with th un r tract

Th art lecc c m l m thyl i l h h
is kn wn s s l am ath Th d r b r h
less t nde c s to crystal z i the ar tra t
whether the uri e b stro gly acid est rpl a s
line Bv c ntr le p r me t f the dru th raga l
to its d ages n l concentrati ns in the bl l
p nal fluid the conclu o as r ched that a c
centrat n of m s than fr m ot s m m l co
cc in th pi l flu d nt ma ta ble B
a logy with sulf d z these p l l l l
are not l ch t bethray t ally fl ct
458 12 n 100 MD

Glemer I Ophthalm logical Feat l l l ra
crani l Ch rd m s d Allied Tumors f th
Clru l k Op k Chc 1945 33 39

Chordoma re tumors of the pr m t n t ch l
and th r f e theoretic ally capabl f apy a
anywhere s the le gth f th ert bral c l m
The mo t comm n situati s i th sacre ve l
regio but the c s l o n nt resting p p r
at th cranial end of the r stebra l l l
reman s of the chords dorsals are so nd pe ll
n th b s l a plate t the sphen o c p l i j u t
or l u Less th n oo such tumors ha e b r
po ted date

Th symptoms r headach sual d turba
n sal b tructi n a d pa t the n ck Th
n tal cy for the ca lal n rves t b l l
p rticula ly n o e s d e c n th gh the m
aris n the midl nde the pons F ld f t
m v h due to i l m nt f the opt c ham l
choked d c s o opt c t ophy m j n c u Ophth l
m ple as of ary g t t w r f u l a d g t
the s olveme t of th th d furth a d th
n rves The seventh r f c l nery w s l
n ol ed w th the th C mpe n f th b
t m at th p e s r t the medulla r th f m
agnam led to h mpar s s m ca es l a
the c l cau ed by l w ly g tum r r l rfe
th th ppe c r v cal rves

Fr m the r ntg s t ndpo nt charact r t
v haped or h may b f d i th b l r g t
A c t cul gram may sh w le at n l f th th l
e m l Tw ca es f this c r dit ad
quat ly epo ted C mple m e l f th t r r
is rar l v po s bl 457 243 100 MD

Houseal R W and Gerbasl M J A Report 191
Cases of Meningococci Infection Admitted
t St t n Hospital Camp But r n th
Carolin f m N mbe 1942 t S p t mber
1 1943 1 York St t n J l 94 45 37

The a th r s r port es 193 e s f m
goc cc f ct n d d cu the l cal p t
d th t ater nt f the cases
Th p e t t th t l u ng W l l W l l
453 ca es f men g e c l m m t s a
m tted t l ed States Army Hospi tals w th r 855
d ths m r t lly rat f 38 per c t

At the present time a mortality rate of less than 5 per cent is prevalent.

Some of the patient is presented very mild symptoms a little diagnosis was difficult without careful observation. Others with severe reflex intractable to surgery presented no difficulty upon electrical stimulation of the brain by pin electrode.

The various symptoms and signs and a full
thorough examination of the hospital to prevent lat
1 gross error reviewed

The patients were treated with sulfadiazine and sulfamonomethoxime if blood appeared in the urine. Daily nonprotein nitrogen studies were made and when there was an elevation of the level of this factor, sulfadiazine was discontinued. Meningococcus was also used as an addition to the sulfadiazine and this was believed to be a definite added safety factor in the treatment. Three deaths occurred in the series of 93 cases, a mortality rate of 3.2 per cent. All of the deaths occurred during the first 10 patients admitted. Among the 1183 consecutive cases there were 5 deaths.

in the skin over the third lumbar vertebra and a small opening at the crease; otherwise she was in good health. In October 1941 a nurse traced a line from the dimple of the skin down through a fissure in the lumbar vertebra to the duodenum. This aetiology of the disease was revealed by the fact that all of the tissue was composed of dense collagenous fibrous material and a lining of degenerated gastric epithelium apparently of gastric type.

These 2 cases emphasize the necessity of early recognition and complete extirpation of the dermal neoplasms. According to Walker and Bucy, the development of the cutaneous epithelial neoplasms from an incomplete dermal sinus tract is a common occurrence. In the first case, the sinus tract was found to be a dermal sinus tract, and in the second case, it was a dermal sinus tract. The sinus tract was found to be a dermal sinus tract, and in the second case, it was a dermal sinus tract.

T. LEECH, M.D.

SPINAL CORD AND ITS COVERINGS

Walsh J. I. and Iract T. m. H. R. Co. g. n.
It i De mal Sinus a a Sou ce I M nt g al
I lecti R po tol 2 Cases t A oct ted with
Recurr t M ninglti J P d at S Lo oas
7 20

Con e tal d mals s is rare l e : wing th
lt atur the auth rs e able to ind ly 7 ca es
p blished ly Walker and B cy in 1934 d i ca
decr bed by O Connell in 942 Sinc th l n
m f rm the r ute by wh ch fct n hes th
m n e the auth rs report ail tr n l ases f
thir n

[illegible]

SYMPATHETIC NERVES

Litt G D Alc 1 1 Injection of Sympath 11
Trunk J Am St 12 945 S 470

The author examined the following hypotheses:
 1. The lumbar sympathetic system is involved in the control of the lower extremities.
 2. The thoracic sympathetic system is involved in the control of the upper extremities.
 3. The cervical sympathetic system is involved in the control of the head and neck.
 4. The sacral sympathetic system is involved in the control of the pelvic organs.
 5. The sympathetic system is involved in the control of the cardiovascular system.
 6. The sympathetic system is involved in the control of the respiratory system.
 7. The sympathetic system is involved in the control of the digestive system.
 8. The sympathetic system is involved in the control of the reproductive system.
 9. The sympathetic system is involved in the control of the endocrine system.
 10. The sympathetic system is involved in the control of the immune system.

1b t chnque l that whch has be n l
bell Och n r a l DeBakey w th a f w m n r
h g s It s r c m m n e l t that a p r o c e r l
m j l pat t s m h m a p e r a t i v a t t a k
th l m b a r s m j a t h t i c y s t e m c n b e c
s t l s a f p r o c l r l l o A R O S M D

MISCELLANEOUS

B id	F St l les	Steel Wire Mesl In th R
pat	I Sm ll Crn l l Delect A S g	1945
18		

Th a th h mgl ed st les st l r
th 65 h e 40 b 4 71 by 28
t doo s h 60 by 60 d 28 by 28
tf th ep r l small defect n the sk ll sucl
th fry t f r h les part cularly in th
f t l g r sm ll r m t c l f c t reco l
aryt dra ge l b mal cess

The mesh used periodically in a way
 is kept at a distance from the second day
 the first of the bone. The arm is
 the perat. The head that the erect
 had to penetrate between the meshes. The
 high-co. The second but freely per-
 cutes the first. The second. The first
 a prod. The second. The first. The first.

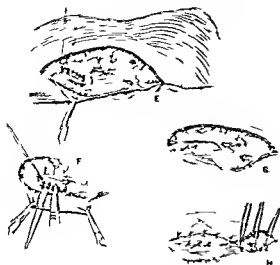


Fig. 1. The lung of the h. ch. l. t. p. C. S. m. p. f. l. l. t. es. t. ed. flap. i. pleura. t. be. t. ed. h. l. d. in. h. most. t. F. l. t. t. p. ced. be. t. ee. pl. r. al. flap. d. d. f. th. l. h. l. t. p. G. M. t. t. est. ed. th. co. n. g. th. d. f. th. t. p. H. Add. t. nal. f. m. t. pos. bl. so. ses.

Th. m. th. d. f. b. ch. l. c. l. s. h. s. b. d. n. bout. 14. c. ses. Le. ka. result. g. f. m. b. ak. i. gopen. of. the. stump. occu. r. d. n. ly. case. Source. Kan. M. D.

M. W. R. J. C. R. d. h. i. n. ft. Intrap. rai. Caut. r. iz. t. n. J. Th. S. g. 94. 4. 94.

Lo. f. effect. e. p. u. l. m. o. n. r. y. fl. p. th. g. hear. l. d. h. es. n. f. the. lu. to. th. p. r. tes. n. f. q. t. but. m. p. l. c. at. n. o. f. d. p. m. n. ly. It. s. d. l. ea. ded. as. a. irr. m. d. bl. nd. t. i. e. st. ab. ly. e. al. g. the. ab. d. m. t. f. p. m. thorax. therapy.

M. well. dis. ses. the. caus. to. d. p. t. n. of. the. c. m. p. l. c. a. d. g. es. c. t. f. the. do. c. p. f. d. g. s. d. es. l. d. 6. ases. which. n. p. r. at. e. t. t. m. p. t. r. e. est. l. i. sh. f. f. i. c. i. a. c. i. o. u. s. c. l. l. p. vas. de. tak.

Ob. l. t. r. at. e. f. a. p. a. m. th. r. ax. sp. c. aft. d. h. e. sect. n. may. occ. th. acute. s. cond. ry. and. l. t. e. form.

1. t. M. t. e. t. Th. s. su. l. ly. d. l. ps. with. in. forty. e. ght. hours. of. per. at. d. f. n. t. al. It. s. con. d. ed. seq. l. it. ol. re. p. e. n. s. as. a. esult. f. m. s. e. escap. f. a. i. from. th. pl. al. ca. ty. the. prese. ce. of. pl. r. al. ha. ges. that. lead. to. rap. d. ad. here. e. f. th. vis. u. al. and. pari. tal. surfaces. Pul. mon. r. v. emph. =. ma. s. e. e. p. o. t. per. at. i. co. h. i. r. m. t. u. n. a. d. in. dequ. t. lo. r. e. f. f. the. t. o. f. punct. e. tes. are. re. d. u. ced. the. chi. fra. c. t. u. r. e. f. l. n. g. e. x. pans. n. The. pos. b. i. l. t. v. that. tube. cul. os. is. may. be. a. f. ct. b. prod. cu. be. ck. al. t. p. e. f. bro. ch. i. al. b. tract. ft. p. e. m. l. s. that.

results in rap. d. re. e. pa. no. of. th. lu. g. a. d. loss. of. pn. umothora. space. ca. not. be. ruled. out.

S. c. d. r. y. ob. l. e. t. Th. s. c. u. r. s. w. th. e. c. k. or. two. of. per. at. i. o. d. t. e. d. to. be. m. re. lo. cal. i. than. the. h. r. s. t. a. r. t. y. the. s. tes. of. pred. l. t. i. be. th. post. mediast. um. th. para. r. t. e. br. al. gutt. and. the. a. ea. of. post. i. r. chest. all. bet. cen. th. r. ng. l. es. a. d. poster. r. a. il. l. a. r. y. l. e. r. f. red. t. cop. c. ally. as. the. scap. ul. r. z. D. d. e. l. ad. h. e. r. n. surfaces. alone. or. ju. ct. i. th. e. u. l. y. t. c. pl. r. al. surfaces. m. y. be. l. ed. F. ult. p. o. t. operat. ve. postur. dequ. ate. c. t. r. l. f. i. trap. u. l. p. es. es. or. both. the. impo. t. a. t. ca. al. fa. t. r. e. L. t. M. t. e. t. Th. s. i. n. a. ly. l. a. y. s. a. s. qu. l. t. po. to. per. at. i. e. f. f. s. o.

Exposure. t. the. gases. of. a. p. um. th. r. a. g. l. l. y. l. t. ers. th. l. ng. pleur. i. surfaces. Th. y. e. l. l. y. he. com. c. ed. i. th. a. f. e. p. l. l. i. of. o. g. a. l. lymph. a. d. d. t. d. b. e. e. r. ad. ly. h. l. l. well. come. int. c. ta. t. However. at. th. tage. wh. pneu. m. ly. u. u. l. ly. per. f. r. m. d. th. t. th. ar. y. m. th. s. f. p. n. e. m. th. o. r. a. these. cha. g. w. a. rule. abs. t. little. o. ted. and. the. pl. r. al. lay. r. d. t. n. es. a. ly. b. om. d. h. e. t. h. all. wed. t. t. ch. i. af. h. a. r. s. o. e. e. n. i. j.

I. e. t. l. u. d. s. th. m. t. e. f. l. l. i. t. f. l. u. p. t. i. f. e. l. l. i. ng. th. mediat. po. t. p. at. p. d. d. i. t. fat. t. h. l. d. n. th. l. f. t. t. d. c. b. au. th. t. nd. t. f. th. u. p. at. d. s. d. i. t. th. b. ck. th. m. s. p. n. e. post. the. l. s. t. t. po. t. b. g. part. c. u. l. a. r. d. gerou. M. o. th. s. c. e. p. t. i. c. g. th. s. a. d. p. r. e. s. c. r. be. po. t. t. c. r. t. nt. u. r. s. ng. th. e. p. t. e. n. s. s. i. t. g. up. aft. r. p. e. l. ca. ut. at. or. l. y. o. th. p. at. ed. l. l. l. l. n. g. d. r. n. o. f. i. t. r. al. d. h. es.

The. tre. t. m. e. t. f. estab. l. i. sh. J. a. l. h. h. M. l. p. r. at. e. th. ly. tra. d. c. at. u. b. t. n. e. tub. cul. f. the. pleura. a. p. m. thorax. i. h. h. the. c. l. l. p. e. c. h. e. l. by. the. r. g. n. l. p. e. u. m. o. l. y. s. i. s. i. deq. t. a. d. t. cap. bl. f. be. m. m. p. ed. by. sub. q. t. p. o. ced.

M. W. l. d. i. s. c. u. s. e. s. i. ta. ces. of. r. d. h. es. i. f. th. l. n. t. the. p. r. tes. t. e. t. c. l. s. e. p. e. m. n. l. y. s. f. th. pat. n. s. e. t. e. at. ed. by. p. at. e. m. b. i. l. t. n. s. b. y. i. m. m. d. i. a. t. e. r. v. e. t. and. d. tach. m. t. f. the. lu. g. nd. by. ca. t. iz. at. s. ek. aft. re. d. h. es. Tube. cul. os. em. p. y. ma. f. i. l. l. i. rem. h. ul. i. z. at. n. p. t. n. w. th. b. c. lo. i. f. th. pl. r. a. P. r. s. i. s. t. nt. eff. u. s. d. l. p. ed. th. r. p. at. t. wh. m. th. c. l. l. p. s. e. ach. v. d. by. th. l. p. m. l. y. s. w. s. t. f. c. t. o. r. y. I. the. 4. p. t. t. wh. m. th. r. i. g. n. l. flaps. w. c. m. p. l. t. ad. q. at. a. d. th. ple. r. a. f. e. f. m. t. b. r. e. u. l. os. is. the. l. n. wa. m. h. i. l. z. d. a. d. pneu. m. th. r. t. d. w. th. t. comp. l. cat. STERN. A. ZIEGL. M. D.

Tinn. y. W. S. nd. Olse. A. M. Th. S. l. n. i. f. i. c. a. f. f. l. d. in. the. Pl. u. r. al. Spac. J. Thorac. S. t. 945. 3. 45.

Th. pres. f. l. d. th. pl. l. f. al. m. at. l. e. d. i. c. at. f. r. s. g. l. e. a. e. l. t. n.

d btl whether pleural effusion is v r a primary disease I r o of the series 1444 c es of fluid in th pleur l eav ty r ported by the authors a definite diagnos was n t made yet there as cl cal e i de ce to favor a dagnosis of eith r tuberculos s or neopl stic dsease in r s f these cas s In the rema in g 66 cases a diagnosis m ght h been made if there had been an opportunity f r bseruation or further stud es of the pleu al fluid

It is important l emphas e the necessity f rcare ful exam nation of th asp rate l plural fl l The gros character sties should be accurately ec d l a d the peafic gavity and numb r f cells should be d terminel As arch for neopl t e cells ether by the m th d g reviously describel by the auth rs or by th parafin sect on meth d sh uld be made Bacteriologic l study sh uld clude cultu es n suit abl med a n l frequently al i culation fgu ea ggs Wh the presence of chyl th rax ssu pectel the fluid sh ld be sta ed with s d n ill shaken th ether and chem c lly m alze l f r t

In a considerable number of cases it is f ficult t establish an act dag sis In m st sta ces it i et s pectub reul s an l i r t the pat e t ce d gly

HEART AND PERICARDIUM

N rma ll B a d Aln w tl R Vl Si pt l
occcat Pl pericard m Tre d with P t U
ll B l M J 945 806

Hea pen ellin has b n sea ce d r p e t d
ject of th s drug ar excee ngl tryng t a
l b l tated pat e t s tle rul th l e l a p l e a
tion whenev rit ill suffe sh uld be ec plac
f temiet atm t It s r g iel too that
th us of p cillnd evn t a s ser pla s r
n l d i ag l th t h p is f m l a
quantity it n t l e c ted l h ca f r b l
staphyl e c c l n f ection of th p r ardum p r
ed in th eurse of a eys typh id f c
tin The c suing p v o r i c lum s success l l
t ated by the repeated f t n f p u s f th
t l l a n f s l u m p m l l t th f r i c i a l
cae

Th ccu ence of staphyl e ceal py pe car
l m th ca e f a s l h l ady g a ly ll th
typh ife r l rec ted Th success fult m t n t
rth p e cill l pen l po wh tle t p po
blet m i t a p e m t with l q t c n
centrat n f th l Th r e r e p e c l l f ficult
n d al ng with th l tol p e e l m It i l l
fult to be cert that h f r t r h b
do e adeq t l r a g f th b h ed
With ext r infect n f th s p e r f e c l l
th chest all t h d t sure th t h p e car d al
sac r t t m ted with second r s al g r
p a m h char p e cill res t t
l th ca l e m p m th r a m t t t t t
l comm t g t es l l g r o ly t l k l
l a l l l hest w l l k b r e c t may be
necessary to r m e t s e f b s de p o s t s

fom the empyem earty Th l results in p v o
pericardum in which the e p e f s u g e r y m
l m t e d are likely to b less sat fact ry Attenti n
rs directed particularly to the long period l u r g
wh ch the reaccumulation of st rle j u s in the p e r i
ca d m p e r s t e d B e j m GOLDM M D

ESOPHAGUS AND MEDIASTINUM

Richard n J R A New Treatm nt f r Esoph g t
Ob truction Due to Meat Impact n A Chd
Aa l l 945 54 3 8

La g m s es of meat and fish with and with t
bo e occa ally lodge i the esophagus a l l
stru t t Th s occurs m st oft n in p rson th
co stracted or narr ed esophagus The auth r
d cusses a umb r f cases f th s type i h l l l
m s es cons d of m at without bon

The onset f the c n dition is sudd a l ure
wh l the h l a l s cat g R a l l i n l e t l
Som times m rph la s the n rmal esophag
suffe ntly o that such a m s may l l l n i n t
th st mach If treatm t is g en in the mat
d c s t m Th t k s l m ev n t f t t
t y s c d g t th s f the m l l l j
t t u r v e s l th u g h u a b l t s l l l j l
d f the esophagus t l l s t l e c l f e c t l
po t a s s r e c r y ca ccu l h r

l l th t t h l v s m d f r t t l
esophag p e g l tly es l call f t l f t t
has ted eral days b l r e k g l l At
p r a t n u n l r d r e t t l f l p r r g
body ca b r m d l l e n tly f p a h
b u e d u c c e s f lly t l l s o l e i m p a c t l n t
A m m r f e c e u t i c e h c h t
m l p r e s n b e l a r e p o r t e l a t l t l
Th m j t y f the p t i e t e r e a t f f h t l r
r th l c a d e o f l e The treat t u l w
l e t a d f e a c l e e 3 p a t i e n t e g i n
p h e l a t r p u n e with n o a l n t g e Th i a
th r t i e n t s h l a m l e a t f n y s e r t f t
th s p e c e t p p n s o l u t The results w r
g r a t i f y i n g The s o l u t i o n u l a s c o m p o d o f
g e c n t p p a l s o l v e d i n a o p e r a t a l c o h l
b e l s t o c k s o l u t i o n d l k f f r a g m e n t
k O n c u b i c c e n t i m e t e r f t h s e l t i n a l
m t d r y f f t e e m i n u t e s l l g o o d r e s l t
O b e c e t t e c t e l l b e r t a f l y h t p a
t t s h w e r e a l l t s l l w r i w h n a
t p o o l i e l l b e t k t h m a t l e s t l m r
p e d l F W L C R m s r k M D

Shaf r J Cong n l t Stort Esoph g Compli
cated by Vit min B Defic ncy G r e e M J
945 43 5

Sh f e r e p o r t the c f a f r t y y r l l
m who m p l l f p r a t r e p n a l a
p a l o y s l a p p m e r y r e l e d t h t
t m l r a t e d r the l f t p o s t r w l l
t ches l m th teeth th l u m w r t
r r o f t s o m s n a m e s t e d T e a t m t e c
t e d th a p p a c a t i o n o f m e a t t o th

Plural: 1 m t ften cau es e erefunet nal
mpairm t f lung wh e spar h rial les o s
m y h r lat el ltl flect n p lm ary fu
t n Dur p e moth ra t catme t the collaps
ed lun fows a decrea e of oxy n i take m ute
o'um tidal ai ntal capacity res rve
and compl mentary air Compe at n is ache ed by
an i cr ase of the o ygen the oppos t lu
fhis is o l part of the res lt f ll wing n sed
ent lat n Oxy n ntak furth ne ed by a
better utilizati n f the e tilated gen i ad
crease of the ventilat o equ val t

Th rac pl sty cau es s m lar lunct onal ch nges
s does pn um th rax but n the a era e these
changes are les seve e f ll w ng thoracoply than
a te coll p e by pneumoth rax Lun s r e p ded
aft r p mathorax tne tme t o f n show ext e
functi nal impair ment

A change in the pat e t postu e from the sup ne
posi tion to th l ft o right s d does n t aff ct the
percentage of distributi on of the t l cap city be
tween the l ft and right lu Att mpt at mm
biliz ng a hem thorax by ss d bags w h n p t
s pou ds and by strappi g ith adhe e tape do
n t prod ce a educti n f th ent lti on or of th
resp ratory wo l f the u d ly ng i ng
Sures Kan MD

Orth O S Wilhelm R L and Wat rs R M
The Q esti n f Pulm n ry Dam g with
Artificial R pirati n J Th S f 94 4

B cau e c nt olled resp rat on d ring erta n p
erati e procedu es s being sed imer singly th ough
ut the country a compa n study f th v n us
pro edures b whch the lu gs may be ntilated
a u c rtaken Th ma n purpose was t d term n
wh bet any d ms eaa d n t th lu es of labo
t r animal by va o s f rms fa tificial spirati
d t correlate the anat o f press re occur
the appl cati o f th ral method w th s y
morph l cal ha ges that m s h been prod ced
s r i perime ts re per l rm d D gs
d r mbutal amv t hl ral h rat a f
th d ethal th r cy lop pa rt s
thes ere uby fed t p od fa tial esp
t n s e f om n t h urs Aft r t w
f u d that gross p lm nary dam as d t
th n two h rs and as gr a ta that f ll g

six h u test period two-h ur per d w ge
ally used i th eria ng tests To corr lat t
cha ges f pressure produ ed by the vari us m t n
ith morph log cal cha es hch right occu
the l ngs recordings we e mad of th ral bre
chiolar (pulmonary) a d intrapl thral pres ures b
con ecti s to three separate me curs manom t rs

Some of the methods nvest gated n l ed th u
f pos ti e press re l oth rs a comb at f
alternat g posit and negat e pres r These
methods er (1) m ual pressure ag it r rubbe
bag () manual pres r on the th rac c ll (3)
t o-phase (pos ti e negati e pres u) type f res
ciator (4) th Kreis lman bell s (5) the V f
L d apparatus (6) a Dri ler type f res at (7)
a wind bld w per t p e f re p at r a d (8) the
E e rocker method Each f the ght methods w
used s parat ly on at least 6 d f e t ma a l
se eral f th m thods were teste l a m n
r e d d gs

Th res lts showed that n s g i ca t alt rat s
occur ed n the d ect blood pr sur rec r l g
duri g the r e ut ne u e f m th d ls ally a l
quate oxygen ti on of the b l x l as prod c l e h
p rum nt l l t loge ll th l b fr m a few f
the c nt of animal on g p t asse f
mo e ne ly ormal than th e f r m th a res f
the e p rime tal gr p M c r c lly l d
f r nati s possible No method w supe
rior tother n of r a fal et au e pulm n ry
ha s a concern l Th r w s not s g l e s e
t on hich d d n t sh w me ile ceol ad rm l
t The se t s of lung f m th co t l n m l
e th th e killed imm lat ly or th e killed aft r
a p d f an th a eq silent to th t w
method of rt cal esp r t n w e ppl d e
ta d th m types of l m g d t u s th
taken f om an m l h h the m p lat s f
rub ual resp rati n mply d

The mo t mm t l g s f rt lat l cta
ng st hemor bag l l t n a d b ch al
pasm

That time not an mport t su n th
f t that a s x hour p od f t n eal resy
ca ed o m nica t cha tha d l t
h pe f Any dama h h l l oc ur n th
f rs w re rs ble s l l that pe
m tted t rec e d f w th t l la
A / M MD

e doctrine of urogenic of what ex p r t r at may be that this factor which is the go r m g n fl ence r a n e s the se enity of its effects with resultant remiss s a d r e l a p e s i t s gastric m a i festatio s that remiss on m y be perma ent a n tural cure can occur that th factor wh t e e r t i s may b m itself out just as the f l e c t s of untreated prim ry Graves s d c a (thy co t c o s s) may cea whe th t i f l e n c e burns itself out although the h t r y b e wrecked or destr y d in the proces i ther f these cond tions

The d r e e of gastric a c d t y may be a i n d f the vary ng se nity of the causat i f l e n c e a d s th e f o r e i m p o r t a n t n p r o m i s but it is t prime cause n itself

Med cal tre tme t by mea s of d t i n g a d th use of alkaline powders et c t e r a s n m o t b e r g a r d e d a s c u r f o p e p t c l e e r th a t h e r g m e f d t i n g n d l n c o s t i t e s a e f t d b e t e s m e l l t u s

I t h n l y s t a t i c a l r e v w h i c h t h u t h has b e e b l e t d c e r o f t h e n d r e s l t f m e d c a l e t i m e t t h p o r t o f a t i s c u r e d a d the results g e l l y (a f t f i e t f i t t e e y e a r p e r i o d) w b s t a t i a l l y t h e s a m a s t h c a e s t r a d s g i c a l l y (a s t h e p r e s n t s n e s)

S g a l t r e a t m e t c a n b e o f b i t a l y t y s b o t h f h c h a r e m e c h a n c a l n a m l y t e x t r a p a t f t h v u l e r a b l p a r t s w h i c h the d i s a s e m n e f e s t e d (t h g n t t h e t r u e a t d c a o f i t) f o r e a m p l b p r t i a l g a s t e c t m y A l t h o u g h f t e f i c t i e t h i s u l d t b e g a r d e d a s c u r t h t r u e s n a y m t h a t h e a m p t a t o o f a g a g e n u s i g c a b s a d t h a e c u d p t t f i b u r g e r s d e s w h h a e s l e d i n t h e g a g r e n e

R e l i e f o f o b s t r u c t i o n f t e x a m p l t n i s a b y g a s t r o e n t e r o s t o m y R e l i e f o f b s t r u c t m l o b e t a k e n t o i n c l u d e t h e m e c h a n c a l b t r u t t t h e m o m e t o f t h e s t o m a c h a s f a m p l f r m t h e a d h e s o f a u l c e r t h e p a r a s w h h m e s t o f o m t h e b a s e f t h e u l c e r P l a l y t h i s s l o a m e c h a n c a l b s t r u c t t h e a l e a n g e s h u l d p m a t r m s s o o c c u r a d o n l y b y s u r c a l m n s c a t h s o b s t r u c t b e e r o m e W h n p e r m a n e n t a n d a p p a r e n t l y t r u e c u r e f l l w s e t h m e d c a l s y n c a l t r a t m e t i t b e c a u s e t h a c o c d d t h a t a t u r a l r e m i s s f t h e s t f c a s a t f a c t r r b e c a u s t h p c e s h a s b m t t l l t (a s m a y b e t h e c a e i n p s y l n t s i w h e t h g a s t r o e t e r o t o m m l c o m p l e t e s t h c u r e b y t h r i e f o f t h e s d a l m e c h a n c a l b s t r u t)

B l i y t h e n t h u t h b m t s a c o c e p t f p e p t c l e e r d i s a z w h i c h e s n t i a d r u a n a t a l c o u r s d m a b e l i f e g T h i s t b y a n y m a n s t e o e s t t h a t t r e a t m t i s a l l e s b r a t h e r t h a t i s s e p e m t b e c o n e d i n l a t t o t h n a t a l h i s t r y f t h d i s e s e I t h s r e g a d t i s b u t h a t m e d a l d e m o n s t r a t e m e t e a c h h a s i m p o r t a n t a d t s o m t t

c o m p l m t r a r i e H e r f t h e g e r a l l y t a s o f l l f m s f t t m n t a e t n r e t f a c c o r d g t o t h s h y p o t h e s i t m y b e p o s s i b l e f o r m a t r u p t c e f t h e l k l p r o g n o a d t h d l l s i m e n t s w h i c h h a v h i t h r t b e e s o c o m m m a y b e a v o i d e d

I t i s s h o w n t h a t p e p t c u l e r a t n a c o s t i t a l d i s a s e e s s e n t i a l l y r u n i n g a p r t a l c o r s e i r r e s p e c t e o f t t m n t

J n F K l P A T R C M D

W t h R M T h C o m p l i c a t i o n f A c q u i r e d D i t i c u l i f t h J j n u m d l l m R J S f 945 3 457

A c q u i d d t c u l s s o f t h j j m a d l u n o t u c o m m n A p p o x m t e l y 225 a m p l e s h a e b e e c o r d d i n t h l i t e r a t e T h e c l e a s n a c q u i r e d e a d t h d r t i c u l e e o f t m c o u m e m b r a e h e r n t y p e A s a r u l t h e y t l t h e i r w y t h r h t h m u s c u l r c o t f t h t e s t e t t h e p o t w h e t h m n r t e s p t h e m f t h u p p e r j j n u m m o s t c o m m l i f e c t e d D t c u l a t h e u p p e j j u m t m t l l a y s m l t p l e a d t h e r t a l n u m b e r m y r u n t h u d e d h e r t h y m a y l g p t j a c h e s a n d m t T h y h e t h w a l l d w l p e g s i n t h l u m e f t h i n t e s t f t h l t a l f m t h o p n g i n t o t h l m e n o f t h i t e s s m l l

T h d s a s f l t e r a d l i f e d t h e m j t y f t h c a s e s a r f n l i c l t l y t t j D y p p i s e m m l y c m p l a d f T h e m p l c a t w h e m j j s e t t h j j n a l a d l l d r t c u l e t h e c n d t n f l e m m l t h e g a t i n t e s t i t r a c t

A c u t d t c u l i t s f t h m l l t t f t t h l f o i g n t a l d t c u l h s b c o o r d l l v g t i m e s 3 a d d t a l a m p l e s d d e d i t h f m f c a s e r e p o r t s T c a s e s i t h e p r m a l j j u m n d i c a s e w a i t h l t l i l e u m T h e s e d t c u l e e i n t h e m s e n t r y d t o t h e b o d a d e a d b t u c t s y m j t m d t t h i r l r g e s a d a c u t f l a m m t T f t h p t e n t s l e d f l l w g t h p r a t b t p t t e p l o n t h e t h r l p t p e r a t d l a l y f t h g e s w h i c h l t c t d d l l y b o s a s t t l c y t w d p e r f a t a d a d h s m a y f r m h h s o m t i m e s c a u s e t e s t l b t r u c t u l q t l l 6 c a s e s t h l e s w t h j j m m t 3 c a s e s t w a s t h l m T h e e a r r t h c l w p p c h e d t h m o r e c l y d i t h l t l a s m u l t t o t h e f a d t h l A c u t d t c u l i t s i s t h m o s t c o m m m p l i c a t i o n f d r t c u l o u s i s f t h j j l e m f u r m p l e s f c r e t n f i m a t i o n a r e o n r e S a l e n h m r h a m a y o c c u f m j j u l e r t c u l m 3 c a s e s c o d d T h e r w s l y e m p l i t r a m a t r u p t T h w c a s e s e m p l a t e r b l u l T h p e s s i b i l y f r m l e c y c o m p l c a t h i b e c d R c m o J B t r r J M I

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Kude K nd Fnn W F Th rapeut c Int rup-
tion f Preg anc A J Ob 1 945 47 6

From Sept mb r 193 1 December 943 the
w So i t rupt s f pr gna cy f r th rapeut c
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Yo k New York Du g th per r d 40 56 pre-
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Tox mia and card ac d eas acc unted for 5 3
per cent of th inte rupt o s B c u e of e e
m o d e s f th rap i t rupt of pr o n a n c n p a
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a c y r a r e c e s s a r y a t t h e e n t i m e

F r y d e i n e g m e R n l l a c o u n t 1
f 6 2 p e c t f a l l t h t r u p t n s p t f
t h g r a h l e t c t d f f a p
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T h g e a t e s t n u m b e r o f t e r u p t n (3 0 4 3
p e r c t) r p e r f m e d i n f m t h h i t h t h
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P r o n a c y h a d b e e i t e r d c t f p r l o o
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p e c t) T h i r t n (6 p e r c t) t h t r u p t
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p e c t) p a t t w e f b n l

T h r i e h t p n a s e s o c r e e d 3 w m
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F l e (3 0 p e r c e n t) f t h p a t i s w h h a t
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t r u p t n e l h e s e l f i 2 0 r e p e a t i
m t n f p k c y l o n o p a t t a
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T h r w e s i d a t h O f t h 2 c u r l t h
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Edward L. C. R. Ell, M.D.

Woodb ry R A Ab B E T r p t R d
F r e d P G N o t m i n M t h y l u l f t f r
P r E t m p s a J t m M 1 9 4 5 3 5 4

S c h o c k s t l L a m b l m l D k m s l
M c h l h d m n t r a t t h t f p r m t l
p e c n t f p r e l m p t i e l m p t p a t t
h s h a b n r m a l l y g a t a n l p l g l b l
p r e s u e f a t a n a s t l u t e r e s p o n t
t e s a f t h e s t u d e s h a e h w a m e t
m b t e c t y l c h o l e a n d p r e s s h h l
t t h e q u t s t h t h r e t y l c h l c t t v
a l t e r e d r a b n m a l e c l a m p t o c e m

T h t u r a l l o c c r n a c t i v l h e c a b e p o t
t e n t a d d b y a h t e d c h l e s t e r a t h e e n z y m
h u c h l e s t e r y s t N e o s t m m e t h y l l f t h a
t h s a c t n f r h h r e s o t h e e f f c t f t h s d r u g
e r e n t a t i f b y t h a t h 7 8 p e c l a m p t
p t t s

I f i l a l s u p t b i t t e o t m n a p p e a r d
t r y g e a t l y l d e f e c t w e r p r e c i
a n c a t h z m m g e n t a m u c u l a r l y
a d 3 m m g e t r a o l y w h l a n t h
c a e r e q r d o o m g m n t r a m u c u l a r l y n d 7 5
m m s t r a o u l y t p r o d c r e s u l t s 1 3 o f t h e
5 g r a d p e e l m p t e p a t i e n t s n e o s t m a l t
n a l l y l a t n t h b l o o d p r e s r f m t t
m m f m e c u r y p r o d e d c h l t m p e t r e f s
t f f m t F d a e i t f t h t r a l
p r e s s u f m 3 t 1 4 3 / 8 3 f m s / 2 5 t

2 0 l l m 3 3 t o n 6 0 T h t h a l
p r e s u e m a d f f o m f a t h n r u t l
t h c t f t h f r u h d f m h e f a d u t t h
t m t t t v d p a s o c i t f w t h l b r
h a d r d t h b l o o d p r e s r l t h t h r p
e c l a m p t g r a v i p t a c o s t m n e l l e d t w e r
t h e b l o o d p r e s r d i f t h e t r a f t h p r e s
r o r m f m e c u r y

T h b e r a t i o n t h a t s o m p r e c l a m p t c g r a v i d
p a t n t e s w n d d f f l y e c o s t m t a
m l g r a p a t t s c o s t t h t p r e c l a m p a
(1) t h t e s e s p o d b r m l y q l t a t i c l y
q t a t l y t o c t y l h o l l m l k l y (2)
t h p l a t a n d o t h t e s p r o d e l h t l y d f
l t h l d a t e f e n t a t w h h a s n r m a l l y
p r e s e t S A M U E L J F O G 1 9 0 M D

d p e t l a n l t e d t h h t t h e p r o c e s s f
l p o t . T o f n d l i u n n r c a l c u l e n t
t h o m a c t a t s t d r o n t t a t c a l c u l
s o m e t m e s a r e f o u n d i n c a s e s f c y s t r a . T h e
o c c u r r e c e o f s u l f a m i d e d n a t e s a c a l c u l f a s
r e c e n t l y b e e n r e p e r t f o l l o w t h e t h r d a t a r e s u l t
f t h e s e d r u g s . O r g a c s u l f r d d n o t i t t h
c a l c u l s d e s c r i b e d . T h e s u l f r w a p r e s e n t e n t i r e l y
i n f r m f m h c h e e f t r s t r o c a s h i n g
h y d r o e n s l i d v a r a d l l b e r a t e d b y t r t m e n t
w i t h a d w h i c h n d c a t e d t h e p e s n e o f i r g a n c
s u l d

T h c a l c u l u s a s c m p e d c h f f c a l c u m
p h o s p h a t w t h s o m c a l c i m c a r b o n a t e a w e l l a s
m a l l a m o u n t s f c a l c u m s l f d e . O t h r d a t a r e s u l t
g f r o m a s t u d y f a t t a l l 53 c a l c u l a r e a l s o
p e s e n t e d . J m . E . F r e r m . M D

BLADDER, URETHRA AND PENIS

J c o b s o n . G . E . J . \ u r o g n i c V e s i c a l D y s f u n c
t i n f l f B f t 945 53 6

f t h e p a s t t e n r t w e l e y a r s s o m e o f t h e c o n f
n f f m e r l y a s s o c i a t e d w i t h r e g n e c e s c a l
d y s f u n c t i n h a s b e e n d i s p e l l e d . A t e t a t e c l a s s i
n e a t n o f u r o g e n c v e s i c a l d y s f n c t i n h a s b e
b a h t f o r w a l a n d m o r e r a t o l m e t h o d o f t e a t
m t t h a n t h s f m e r l y u s e d h a b e a d o p t e d
H w e r c o f u s i o n a t l l x i s t s e g a r d i n g t h s a c t
i f t h e a n o u s t y p e s o f n e r g e n e s i c a l d y s f
n c t r a d t h e l e s n o r l e s r s r e s p o n s b l f t a c h
t y p . C o n s i d e r a b l e d i f f e r e n c e f o p n o m a l s o i t
e g a r d g t h e e l e m e n t f c y s t o m e t r y c y s t s
c o p d r o m a t h n t h e d a m s i s f u o g e
e s c a l d y s f u n c t n

T h e p u r p o s e o f t h i s s t u d y a t a c r t t h
a t u r e a d f d a m e t l c h a r a t i s t i c s f t h a s
u s t y p e s o f u r o g e n c e s c a l d y s f c t n s p r o d u c
d t h e e x p e r i m e n t a l a n i m a l a d i d i t m e
s o f r a s p o s s b l t h e n e o f c a l c u l o r l e s
e s p o b l e f o r e a c h p a r t i c u l a r t y p e o f e s c a l d y s
f n c t i o n . A n f f r t a l s o a m a d t o v a l u a t e t h e
m e t h o d s f c y s t o m e t r y n t h d a m s i s o f t h e c d i t
i n . T h e s t a t u s f t h u p p e r p a r t o f t h u r
t r a c t a n d t h e h a n a p p e a r s e o f t h b l d d e
w r e t r d i e d l

\ u r g e c e s c a l d y s f c t n s p r o d u c e d
p e m e t a l l y n t h f m a l d b y s c r t f t h
h y p o g a s t r i c d y l o r e s b y d i f f e r e n t i a l c
t i n f t h a t r n d p o s t e r s a c r a l e r r o t s
s d b y t r a c t n f t h e c a d q a d p l
c o d

I t w a t f m p e m e t t e s t a t
t h e e d a t t t y p e s o f e s c a l d f
t n o c c u r t h e p e s e e f p e r m i t t l e s s f
t h t r n c r n p p l y f t h b l d d d f t h
p l e o d . T h e s h a b e r f r e d r t t h e
t o c b l a d d () t h u r m b l d l a l f g
t h a u t m a t e p a b l a t

T h e a t c b l d t h c h i f l e s r
l e s o f t h p o s t e r s a c r a l a n d p o s t e r s a c r a l
r o t g a w b b l t r f t h t h

m a l t r a s m i o n f s o r g a n l e s t m t h l l
t o t h e s p a l a n l . T h e e s c a l l a b l l t h u g a
t u l a t y p e f d y s f n c t i o n i s a l l p e r m a c t a l
r e s l t s f r o m p r o l o n g e d o e d s t e t n a n d l s f e s
t a l t o c a u s e d b a n t e r r u p t n f t h e s a c r a l (a l)
r e f e a r s

T h e t i c b l a d d e r i s c h a r a c t e r i s t i c l y w i n t r a
e s c a l p r e s u e l r e c a p a c i t y a d e m p l e t a b s e c e
o f a s y w a s e o f c o t r a c t n i s t h e c y s t o m e t r o r a m
l a r g e r e s i d u u f u n n e i s a l s y p r e s e n t i n
c o n t i n u e c e i s o f t h e o e r r o w r p a r a d t a l t p e

T h a u t o m o u s b l a d d e r i s t h e r e s u l t o f a l e s n e
l e s o s f t h s a c r a l p o s t f t h s p a l c o d t h
c a u d a e q u i n a o r t h e p e l i c n e r v e s (t e n r s a c r a l
r o o t s) w h i c h s e r i o u s l y n t e r f e r e w t h r m a l m o t
e r v a t i o n o f t h b l a d d e r . A s a r e s u l t f t h l o s o f
t s e t r i n s i c i n n e r v a t i o n w l l i n t e g r a t l a d s
t a n e d c o n t r a c t s o f t h e d e t r u s m u s c l e r e n
l o g r e p o s s b l a n d l y f e e b l a n d i e f f e c t
t r a c t i o s o c c u r (a u t o m o u s c o n t r a c t i o n s) . T h
a u t n m u s a c t i t y r e p r e s e n t s e i t h e r a n r h r t
p r p e r t y f t h s m o o t h m u s c l f t h e e s c a l w a l l t
l l f r e f f e a c t i t y w t h n t h v e s c a l w l l i n w h h
t h n t i n e n r p l u s t h e p l y c p l u s o b o t h
p l a p a r t

T h e t o m s b l d d e r i s c h a r a c t e r i s e d b y
c a e d t n d e c r e a s e d c a p a c i t y a d h a r a c t e r i s t i c
s e s l a t o m o u s c o n t r a c t s i t h e c y s t o m e t r o r a m
R e s t a u r a t i o n i s u s u a l l y p r e s e n t a d n
o n t i n e c m a y b e o f b o t h a n a c t i v e a d a p a r t
r t y l l u s t r y c o n t r o l o f u r t n s l e s t a
e s c a l s e n s a t i o n s u l l y s m p a e d . A s a c o
q u e c f t h a t n o m s a c t i t y o f t h e d t r a s m
m e l e c n s l e r a b l w k h y p e r t o p h y o f t h e
c a l m u s c l e s d e d e r o p s l t r a l l e s o f t h
s a c r a l n e r v e s r e s l t n l a t e r a l h y p e r t r o p h y o f t h
d t r s l e a d n s o m d e e a c e n v e s c a l
c a p a t

T h a u t m a t e o r r e f l b l d d e t h r e s u l t f
a l e s n f t h p n a l c o d w h i h s t a t d a b e f
s a c r a l f e l a n d w h i c h i n t e r f e r e s w t h t h e c r c p
p l p a t h a y s (t h n e f h b b t) t t h
r n a r y b l d d . I n s u c h c a s e s t h s a c r a l r e f l s r e
t h s o c a l l e d m e t u i t r e f f e n t e c f t h
b d d e r s c a p a b l e o f r e s p o d n w t h t h l l s
t n d n d w l l c o o d a t e d c o t t f t h
d e t r u s m u s c l e

T h a u t m a t e o r e f l b l d d e r c h a r a c t e r i s t i c
b y d e c a d e c a p a c i t y i n c r s d t n d c h a r a c t e r i s t i c
t r a s t e w a v e s f a t m t r e f l c t r a c t
t h y s t m e t r o g r a m R e s l u l i s s l y
p r e s e n t a n d t h c t i s i f f t e l p r e n
a d t y p e o c c u r r a t m t t e t h h t h b l d r
h e s e r t d g r e e f t l l . A l l i n t r y e
t f l r n a t n l o s t a f m s f t l l e s i
s a t n a b a n t

D l a t i n f t h t r s l l l y l y w
f d s o c t t l l t n s t y p e
u e s l d f r e t i . T h s w a t t b t
t m e c h a l c a l p h y s i o l o g i c a l b a s t r u c t u r e
t e s c a l p u c t i o n w h h r e s l e d f m h y p e
t g h f h p e r t i t y o f t h e d t r a s m

The possibility of incomplete of the ureter is called like mechanism (urter is called) has been entirely excluded. The dilatation of the upper part of the urinary tract was found as a result of the material reflex type of urine mechanism. The dilatation of the urinary tract is associated with the type of neurogenic vesical dysfunction. This probably with the result of prolonged uristation of the bladder and the gradual breakdown of the ureter is called reflex like mechanism.

Section of the hypogastric nerves a result may be a temporary decrease in vesical capacity and a slight increase in vesical tone. The emphasis is the fact that the all important innervation of the bladder is the not only the parasympathetic system.

[illegible]

C y t i m t t y t u f l i t l i a g n s s a l l f f r
 t t q f g e c e s c a l l y s t c t t h
 j e m e t l n l T h l t b r t h t t l y
 l i e n t t v l e s c a l l y s t m y l w l
 i m l r i f t i l t e a l y s t m e t r g r a m s f f n t
 t e o n t h a t t h y l l d b e u l t h t
 e l e c t r i c k j o l k i t t M D

From T O St d l i t l e E t l o g y I H
Ulcer J l o f B l t 1945 53 8 3

The etiology of fluorosis is obvious. I will
believe that a disease process such as fluorosis
which occurs predominantly in the femoral
particular category—namely, the femoral
all should have not left itself
relatively uncorrected. The fact is
abstracted.

I s p p o t h c o t t n h points to num
st r o r w h c h f a r l y m g h a t str u t n th
r a l l o f t h e m l b l a d d
The lymphatics of the a t bl ld fl a
tra d e d chiefly by t l r g e t r k I t h b t r u
t f e t h e r c a e s l y m g h a t d m a r t g
c a l t t l t h e s t r u k m m
p l e s f i t h l l l l l l l l

[illegible]

my result as the female hadler 1 h 1 g t
th vmp h s 1 i by tl ut ru
a l the mal pelic surgery a dnf mm t
ar c mm n n lm v l t l trut fth main
ly hatic tr ka

trial lymphatic system of 315 litters with 1 r
not unlike those reported for litters of
Wistar-Kyoto and Sprague-Dawley

Will Ins S F Th Treatm t f Rect urethral
and Rect esical Fitt J L I Bilt 1945
53 79

Among the 18c fr t retr l l r ct ex
c l stula bcr elly th auth ne to 2 tl
l st f c n caues r surg ltr um n n
l l m Of th tra m tic a ne c u lly a
s u and anoth r by exstoe pe a l e f l l r
t tect my (t n ur th l in 2 n l j tin l l 3)
Th r also ca f l l h n att t t r a l c a l
l e l perat n f j stat c ca c r ma

Six of the 150,000 soldiers who were sent to the front in 1914 were sent to the front in 1914. The treatment of these cut-throat was considered the chief of the marriage and the state of the army was the chief of the participation in the test in the army.

Th e e f t h o w e r e d b y t h e s a m p l e m e t h o d s
u n d e r t a k e n t h a t t h e r e s u l t s o f t h e f i l l i n g
t a n s f e r r a l r e s e c t s s a i d t h a t t h e p a t i e n t
t h i s c a s e s u b s e q u e n t l y d e l o a d e d c a l c u l a t i o n s
m a y c a r e m a t t e r m a i n g i f t h e w h i c h
h a d r e s l t e d i n p o s s i b l e c a l c u l a t i o n s a l s o p e r
t o d d l e r l e t c r e d b y a p e t r p a t i e
o p e r a t i o n

In l t t thes z s th t y ether
 f l f l g t nd g T f ths ch e f tu
 l l s l u l observat n w the rva e et al
 m st z th s o v a of ad e f e r t t
 e r m a d the th r a e f e s e r al tu
 be cu w re ob v l u s ualle f a y t
 t mpt t surg cal repa B th pat e ts i d f l
 m g g pat nt s l e c t l t a r d cal
 g rat coo perat i

Radical separat for the cur of chr erect
 r ary l t co t n ap gan lex g tl
 t l t t t c t a l t v l m l l g n l
 par t h c c t m f m t l b l l a n l e t h r a
 The al ap a o a c h i l r l e a c t t h v r
 h h t t a r t h e i r e c f e m p l a u g i r
 b e m l l n T h p e t h b l l r
 r t h r a e s l t g f r m n f t h t c l
 l s e l t h u t t e s l l o r s w t h a f
 t a s a p o w b l l c a t g t c e l l t h e m
 c o s a l t h e r t h r a l o f m d r a n
 l l g e a t h t e r t t t t u d r a n

The total as per general instruction to be
as follows: generally in its importance it is
the next in order of importance to the
first in the list of the most important
to be considered in the first place.

total of 35 000 O f r d u n t s and local therap
ll became culturally negat for th n s na
go ococtus and 3 became a v r p t m a t i c . There
we thus nly 14 p t e n t s who continued to ha e
urethral discharge due to econdary infection

The complications in this series co s t e d f 8
i t a e s of go r r h e a l a r t h r i t i s and 15 f a c u t e
e p d y m i t i s in these patie t s pen c i l l i n d d n o t
have a y p e c i f i c e f f e c t .

Exc p t for the d e l a y p m e t of m i l d u r t c a r i a n
5 pat e n t s there were no complicat o n s f o l l o w i n g
the injection of pen c i l l i n

JOHN W. BEE MAN M D

McLaughlin C. P. Lymphogranuloma inguinale
in the Royal A i F o r c e L a t i t L o d 94 4
80

A s r i e s of 50 cases f l y m p h o g r a n u l o m i n g u a l e
a m o n white a r m e n in the West I n d e s is desc b e d

Even when the c l i n i c a l d a t a w a s clear the
F r e i test was f t e n slow in becom ng positive and
was sometimes p e r s i s t e n t l y n e g a t i v e . The auth
states that it can become p o s i t i v e d r i n g c h e m o -
therapy

O f 26 cases t e a t d w t h s u f a m d e s b i m u t h
21 responded w i l l

The slow h a l i o f a d a c e d c a s e s i a t t r b u t d
t the d i s t u r b a n c e of l y m p h a t c d r a i n a g e rather th n
to secondary infect i o n

S u r g e r y is j u s t i f i e d in lat e s e s h c h d i t
respond t u l l n a m d e s

S i n c e the healing of an a b c e s s u w a s re
t a r d e d by both d i m i n i s h e d l y m p h a t c r e t u r n n l
i a d e q u a t e e x t e r n a l d r a n a g e some u g i c a l a l w a s

cons d r e d l g c a l . The usefulness of a i r a t i o n has
r i g h t l y been stress d and 12 of the patients were s
t r e a t e d i n 1 p a t i e n t i t w a s n e c e s s a r y t o r e m o v e p s
o n s x o c c a s i o n s - i n f e c t the a u t h o r r e g a d e d t h a
t h i s t h i s t e o f a t t a c k w h e r e r f l u c t u a t i o n w a s
f o u n d . H o w e r o n l y 5 f i b 22 m e n r e c o r d e d
w i t h o u t s u s f r m a t n e r t h e n e e d f r m e r s a c a l
s u r g e r y i n s p i t e o f t r i c t p r e c a u t i o n s . The l o c a l
i n j e c t i o n o f d r u g s w a s n o t t r e d

The reason f r these failures was lat r e l a r . At
operation large numbers f l i d u a l g l a n d show
i n g i n t e n s e f i b r o u s p e r i a l n e t a n d c o n t a i n i n g
a f o c u l a o f p s o c i e t e r m a t e r i a l w e f f e c t i v e
W h e n s u c h c a s e s d i d n o t r e s p o n d t o c o n s e r v a t i v e
m e a s u r e s a d d t h a t s k i n a p p e a r e d e e f a n t g e w e v
e r h a d l e d y l l e s o p e r a t i o n w a s c a r r i e d o u t
a f t e r

U n d e r g r a n a t h e s the b a c e s w a s i n c i s i o n
(or the s u n a l l p e n) a n d t h a f f e c t e d a r a e
j e t r e d d e t e l l . The a s s o c i a t e d l o c a l i t y b e
e n t e r e d a n d u r t e r e d m u c h a b r a t a b s e s s i o n
t a t e d b e n e a t h the s i n n l y t h a n t h e f
i n f e c t i o n b a l t h i t i s s u e s s i c k t h e e n t i r e f
the necrot z o n e r a d i c a l l y r e m o v e d . A l l y
i s s u e s w e r e u n d e r t e n a s a r u a f i l l e d y
f i b r o s d t r a c k f i t h i s t y p e

S u l f a d i a m i d e p o u d a s t h n p c k i t t h
w o u n d a n d k e p t i n c o n t a c t t h e b y l i t h f
v i s i n e g a u e . This w a s u s e d w t h l a s t p l a s t
a d i f f i c i l s v e n d a y s . A t t h e s t d r e s s g a z e s
r e d g r a u l a t i n g s u r f a c e w a s i n l a n d i p u d r a d
g a u z e w e r e a p p l i e d . The d r y t h n h i l l
l y t a k i n g a n e r a f i f t y e e n d a y s

J. A. L. M. D.

SURGERY OF THE BONES JOINTS MUSCLES TENDONS

CONDITIONS OF THE BONES JOINTS
MUSCLES TENDONS ETC

Caffey J and Stillerman W A Infantile Colic
Hypotonia Preliminary Report in a
Syndrome *Am J F* 1945 54

The authors report on 3 patients whose clinical and roentgenological findings seem to constitute a new syndrome in the pathophysiology of infants. This syndrome occurs during the early part of the first year with tender swellings in one or more sites—usually the scapular regions and the femoral and multiple cartilaginous hyperostoses in the adjacent to the tender swellings and also in the ribs. On the other hand, the soft tissues may appear to be normal. One of the authors has described a similar case of this syndrome in the *Journal of Radiology* (1939).

The maternal and fetal : fetal of the
patients : essentially normal All but rat y
procedures : studied : all : st : s : ghly
quantitative : studies : the blood : ur : f
a : bic acid : ag : lut : nat : n : st : f : tl : blo : f : and
blood : cultur : s : f : ut : a : v : e : i : f : b : act : r : al :
i : f : e : t : r : of : h : m : r : h : a : g : e : l : a : B : l : f : the
affect : l : be : sh : w : d : hyp : l : a : s : f : th : l : l : l : ar :
cortical : be : n : r : th : m : a : k : e : l : a : g : e : n : th : l : y : t :
w : f : t : a : u : R : o : e : t : g : e : n : l : o : g : i : c : a : l : l : y : th : r : b : r : o : e : d :
e : x : t : e : n : a : l : th : c : k : e : : g : o : f : the : c : o : r : t : i : c : a : l : b : o : w : th : l : l :
l : a : l : n : m : a : n : s : t : e : s :

The a th r s notel that n the l t t es
the cor tal ck n gs dl t t l the tr
l n gth f the bone but left th term al m ts i
the shafts uninvol l n n n f th bo es a
th re l l ment f th sj g taj es a
ephy al pl t i cat t re l h
act e pha of the y l m sub sed l t l
f r r v e r w k th n m p l c a t
ther tha p e r s to t f al l g l l a j h r a g
mat e paral is t f r y a r s a d m n th
case

The 1st re ti l diag mu t unct } ()
 sery h ch ca b rul l t i v th t t
 th first k off a a l q t k l t m
 C by th m th r s a d fant f al w ll g l a k l
 h a t u r a and the a l s n e e f m t h y l a l
 e p p h y a l c h n e s w th h s e n f m i b l
 h y t o t o e s () s y p h l h h r u l e d t l
 th negat r e l g c a l r e t i b t
 l n n t a l i t h b f t e e c h t t
 () e p l a m s w h a r e d c o u n t e d b t h t
 b p a y r e i s a n t h c l i n c a l c o r s f i t h c
 A l t h u h i e t r a l f e c t b e l e d t t h
 t e n t l d g n s r u f t a f a l l r e
 r a c t n c o f r e l w t h f t a t
 k g a l f a c t r s t h e s t a t o l i t r e p a
 t e n t s n M L r e t a M D

Atreos López	Idi	patli	Solitary	Bon	Cyat
(C tribuci	I	t d	I	q	tes
t nos ese a l)	Fr			tes
ort p 945	91				mal

It connects with 3 c s f l i s o w n t h e a u t h r
c u s e s t h e c u s t o m f i d e p a t h i c s o l i t a r y l o n e
c y t T h e a f f e c t i o n f i n d w i t h t h e c s t
f i b r o s t e l a s t r o p h T l l a r e c o i d e l
r b u t a s h h a n g c a e s n h s p e r n l
j r t i c n t h e y e r s (a t l t e n a c h o s t l
h t h i n k i t l l b t h a t m a n y c a s e s
b i l l n t l a g n o s l n t r p x t l T l s e e t s
g r a l l y p p a t e g l j r l f r o t h f
t f u r t e n e y e s O f h a t i s w h o h l e v t
l t h h m e r n a r e a d t h e o t h e r f
t v e r s f a g e n t i c h o h a d a c y s t f a
p h a n t e n t o v e r s l f

Th femur is the bone most leg ntly ffected
 Th t appears as a ca t l he larges th bon
 nd ths th c t l m st th thinness of pa ch
 m nt tpe ll occurs in the metaph s luti ll
 fth a th r ca sitwa ntl laphy s with a c n
 l ll st t f n rm lti n l t een st and th
 t t Th nat f the c t nt pends
 th g f th c t Th mpt m n l
 c p t l l g m nt f the bone until spon
 t n f ctue occur d f n m ca t h r ar
 gu pa n the aff ct l extr m t Th re ar
 g rally g nt ll nll h; lacuna
 Th re ar rall r a t th c e f the
 t l l ngth neopl t th f t phic (wt l
 h ll that th v a ll t l a c f th
 t nal c t n) th n m t an th t

t t t t m l p l t r p h n l
 cu t t f f t h t t h c a t y m b e f l l
 t h a t m n t f t m l e f t g m e n t
 f l l a n t p e r t t l g a f t f t l
 t l l f m t h j a t n t l c r t f l t h c a
 t y t h e a f t e t m b e c t f l
 f h t h e b e l s t a t t h b e t r a t m t i t l
 f t t l g r a t l t l r e s p l n t R o e n t
 g n g m s a t c l l l h o w t a c c e s f l t

C t t m h i n f r l n
 e th d f m t W h t l l r l f r t g l
 l f t l f e g n t h a f n t h l
 A r C M M D

Col B I d St wart I W Bon S rcuma i
I l o stotic fbro Dy pt t t s f 194

11. The first section of the
 at which he was appointed to
 duty as the president of the
 board of the Georgia
 State Bank was in 1908.
 He has since that time been
 connected with the bank.

rat e arthritis of th h j t Th results b-
 is dh arth pl t chr m - lumbar es
 la cia l t r it lum cur as the interpos ng
 med m w e d ag n ng C ners t e th rap
 ie bel r t tract plat r cat imm hizat
 jh cal th j b ght nl t mpo r l f
 Gro ell for MD

Rand H G C. Ewalt J R and Blair H P chla
 tri Reacti n c Ampu tion J t m f f
 94 5 6 jg

The s r con has a d h n t respons hlt inst mu
 lat co denc and i teach g a man to u
 pplances fll w n mput ton Ther snog eral
 agreem t st the p n j eral or central o n f
 phantom mb but m tw r sa ee that th r
 th t ap psychological comp r ti all cases The
 uth r s b l th ndi lu l st tal react on t h s
 j r s a d h s j u m nt t e f g eat r m
 portance to h f t s ful es l e m f t th
 ny sensati n that em to m from h r m
 m mber

Th m st strik n f atu e f th r ent stud
 th h i s d e c f psychopath l g cal c d t n
 n group p rson h seem ell adjust d to thei
 r mediat en nment The en r nment to which
 th v ready ti g hase r t ai featur that probabl
 i d in th s adju tme t and these featu es ho ld b
 ad quately sub tuted in th h m aft r d cha
 On l me t of the h s p t l con m nt is the c
 epta c of the patie t as a o d nary pers n nd not
 as a i alia her t o h j et f p t v Then res
 phys es s fell pat nts a d e en the p le in t
 e r b e ty ha h e m so ceust med to men
 lack n n rmo trem ites that the p t e r
 look d n so the a rage etiz s The facti es
 th m great ea surance n th lea f om th ward
 nd h uld be a alu ble h s t th f m les and
 e p ro j et d s cept o c m m t es n the r h m
 t w n

As nd se tur is th attitud f p t m m pre
 l nt mo the n r d p r s n lan th patie nts

Th importa e of a stable if sve th t
 m th rise r mous Th h s th m nd b
 th r m ally expected exet me tat th re o nd
 c ept the inj r i as n u f r t u ate b t u impor
 tant in c id t g t m nd boot th m rate
 The dramatiz rs the eepers nd th dlect rs dd
 furth r b u d n s to the sold h h l d b p r t c d
 fr m u h foolish b h a

A th r important f t m the h p t l n
 m nt s th group m ral soc l p e a t and
 r t a n m nt f a u e l p o d e t r f This
 n r s b d but po r f lly f r exa j l l s
 pat nts th ies f o c cases had j h a t m pa
 a d or so of g o f d appo al iten b u ex
 pressed plu th ned o struct e t tes f th
 the pat t n t alay th pain a f cor t
 the person to v d h p b l m Th f m es l
 f muly ph s s h l l m com la ts and
 co ra co str cte cte ty e e th h th y
 con dered uns mpath e Th a th es bel thaz

p r t t f a u n f th r t l l e
 th m p e t t y b t s e d f f t e n t
 th m g tat n t bett l more com j a l
 s tment Th p chat ca j sh l f be a b l
 both th b l tal n l f r th y r t u r h
 Th r i n l r a l l f l l u l t u a l l y t
 me t
 S m l j ych path l v n t r m s f j l t
 cha anx ty m t al s stability battl d e e
 and alcoh l m occur i a urp s g p r e t a f
 thes me
 An ne sed r l i s u se f l m m o t i m r
 fr j t i th b l l c u a l t
 K r r l No room MD

Fr j t i th b l l c u a l t
 K r r l No room MD

FRACTURES AND DISLOCATIONS

Ju t a R v nd Lee R W H It g Time l
 Fra tures f the Sl ft f the Tib t d f m
 J F S f 45 30

L t books b m n auth r t nd t unl t t
 th app at t m f h l g f ract f th
 t b l f m The bel f th t ch f t l
 n th a l a p l l tod j a f m l unl l e l
 l t r e t o f c t n s a g u l t n n l t
 l n e of the blood p l l h ch incl u l e n
 r l t n r th most mpo ta t a l r f c t
 n n n nd d l a y j u n n
 f th a th r e s f 36 ca es th h l
 ca f t on in hill n nd l f t n r f
 g th th v e f l g tal fract es f th
 t l Th m t b e n g at d f t r t h
 f n i a g f l l l u n n n n n n n n n
 f n l the gro ng p e r o d w h th th f a t e b e
 n a p e r n f i w t o e f p n t y o j r f
 f

Fh blood p l l the most mpo tant f c t f
 f l f m t a n t n g d h a l n
 N t r e w l d n g t h d l f g n a a ble
 ch n o b th p r e e at n f l g h nd l g m t
 n d b th t o r t o n of f u c t) Th t m
 l l be bett w th com r v t m thod f t
 th h l g t m th c m f o r t f the pat nt and th
 nd result co e r n d c r t l y th chanc f
 m p l c a t i n w h e l e s Th r e r
 tang r s in d e a l g r a t m nt b t n m t a l m t
 th e s t e n d a n t g o f e r t i n f m f n
 t n a f t e n a l e t e d e a Th th r
 b d th l n t e r n a l nd t r n l k l e t
 v a t n l fract n u n s i d a b l n c e t n
 e r t c a e s th r than a a r u l n e m th l f
 h l t u s r w y s p e d th l m f u r n f
 th fract e and f d l a y s t S k l l l f t
 c e s a r w h n t m p o s b l to h l d h f g m t
 p o s t n n a th r w a y s m p l y m e a l
 r s s k e e c u t n f th pat nt fr m th
 h o p t l l f r a l l c a e s e t f n l t
 e s f l a f m m b l a t g f a j
 l w r b e r n g a d l e s f m ch c l
 t h l l b e r a g f
 W h t h fract w e c m m t f l f r
 n l l j p l m p e n j th t l

the la seeme l to mak rv little differ nce i th
haling tme although th communted and c m
pou f fractures vcrage l a litt longer

Fractures f the l w r thir l f the h ft of th
lemure med t h al m e rap ll th n those in th
m ll a dupper thrl The ppr thrl a th
slo est t h al and the most d ficult to man g n
pte of the fact that it was ne er pos sible to c at
d tract on in this are

Th percentage of d layed u on an l nonu n
factu es of the fem r is not so great as in fractu s
f th tbia Th r are mo e ca es of del yed un n
and n non on in the mddl th d f th t b a th n
th pper an l ower th rls

The maj nty f th auth rs pat nt r ces l
m form of calcium therapy during th fractu
tr atm nt with lttle effect on th enl result

In the nstruct n to pati nts a l st d nt du
c n deration should be g n to th l w an l
ncerta nty f the healing of fct r s f th t l
and f mur so that pati nts ma be p par d f r th

l gpc l f tim pos bl n ces ar s f h l ng
In the eries of ca es h re j r s nt l c i cum
ta es in me n tances nees t t l th f

kel tal tract n platng an l e r n l f at n
(Haynes) I n d l th e v th r s f l th t th
e l s obtai e l b uch m th d r n any

peri to those of c n vate t tm nt he
lgum nt cou l be mainta n d e n t th pen
al os of l ngth of a m ch as j' nch

Se ral chart l th h l gpc ol a p s t l
R ext l M t oow MD

F l th M S T l L f S l f n mid In Com
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In sur v y f s y ch l l l e l l l l b e t v r
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At the same time Little is known of the mechanism of transmission of the disease. The donors themselves have blood or plasma cultures that are not known to have spread from jaundice. Because no other means are available to detect this transmissible disease donors with a history of jaundice in the previous six months are rejected. The necessity of such transmission has been reported in the Plasma Statian

But a l e m d n i n p l a s m a i s n o t a l l e l y
f a c t o r e c t i o n s b e c a u s e o f t h e e x t r e m e c a s e w i t h
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7 0 p e r c e n t o f p l a s m a i s a b o u t p e r c e n t .

Plasma Varying m u l t i f i c a t i o n m a y b e e n c o u n t e r e d i n m a n y b o t t l e s . P l a s m a p a r t i c u l a r i n t h e l i r e s . P u l m o n a r y e m b o l i s m c o u l d r e s u l t f o m a n i r a e n o u p l a s m a t r a n s u s i n O n e s u c h c a s e h e n r e p o r t e d . T h i s c o n d i t i o n c a n o c c u r o n l y h e r e n p l a s m a i s a d m i n i s t e r e d w i t h u t p r e f i l t r a t i o n . T h e s i g n i f i c a n c e o n r e c o r d o f e m b o l i s m f i l l i n g t r a n s f u s i o n o f p r o p e r l y f i l t e r e d p l a s m a i s e m b o l i s m t r a n s f u s i o n i n t r a m u l t i h a s b e e n r e p o r t e d i n t h e u n p u b l i s h e d f i l t e r . E a c h b o t t l e f o r p l a s m a n t i m t h e p l a s m a s t a t o n b e r s a s a l a b o r a t o r y g e n e r a l C a u t i o n A f t e r M u t l i c a t i o n

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t h g u p a r a m t g t t p a
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an last rgs m fifteen to thirty minutes. Results of this type are largely predictable. Scrutiny and detailed attention to the proper cleaning of all apparatus used is essential in the prevention of recontamination.

Allergic reactions are usually not fatal in children and disappear or soon after the onset. The allergic reactions respond well to small doses of epinephrine. Because of the protein nature of the antigens they cannot be prevented in the manner. Careful selection of donor plasma for use in the treatment of allergic reactions yet it is not for all the time can be eliminated. Therefore, children will be able to show the treatment of the reaction to a substance normally present in plasma. In certain individuals, the anti-Curt chemical isosyncretism is also a factor.

[illegible]

RETICULOENDOTHELIAL SYSTEM

Carr J L Statu Tl n lev l mp l aticu J
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He suggested that if the machine itself
with the path I built for that man
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that if these changes leads to perhaps the conclusion that the degenerative phenomena in the thymic medulla are responsible for death and not the systemic diseases which may exist in conjunction.

Acute inflammation of the thymus so common in infectious diseases as to be almost a rule and it may occur rapidly from erysipelas or septic thrombosis with a characteristic micrococcal picture. The Hassall bodies liquefy and the granular degeneration and the alveolar cells atrophy. A granular blood body appear. Some cases are on record of acute inflammation of the thymic gland the degeneration of the Hassall bodies in which the reaction is not retrogressive absorption in the presence of x-ray therapy. A clinical shock hemorrhage or other background of disease or physical or chemical changes to which this involutary could be attributed. Cases of hyperinflation of the thymus may be classified in four groups those due to physical effects such as burns shock x-ray therapy and freezing in inflammation following virus or bacterial diseases malnutrition and idiopathic hyperinflation in 5 cases reported in which all of the patients died of a primary disease condition associated with the thymus the lymphatic system and showed the hyperinflation of the thymus consistently in children in a poor state of nutrition.

It is the author's opinion that correlation between the blood would be far more common if it was looked for. In present cases 13 patients of blood the first patient the diagnosis was made clinically and

after x-ray therapy both children died. In the second patient diagnosis was also made but in child's subsequent therapeutic x-ray treatments of the third pair (twins) both died of suffocation almost at the same time and the diagnosis of an enlarged thymus in each was made at autopsy.

In the autopsies done on the above cases no clinical evidences of precocious puberty were located. The enlarged thymic glands of the third twin and glands of the girls with adrenalgia changes.

Sudden death in children resolved into many components and in the course of one case. Stranly enough, large ment with thymic gland lymphatic hemorrhage and similar related and the same causes of death and disease have been thrown into disrepute by articles in the medical literature which are based more on precedent and fashion than on observation. The new popular attitude that the cause is not such as status thymic lymphatic and that the enlarged thymic gland is not a cause of physical by the anatomical cause of myeloma in the thorax can be interpreted. The theory believes that merely a postoperative procedure in the thymic glands is a physical fact and that these glands will in the natural evolution of the child with the help of the enlarged thymic gland lymphatic adrenal hyperplasia and such conditions should be related and as a result of the blood and the appearance of death.

K. F. R. B. B. O. W. M. D.

SURGICAL TECHNIQUE

WAR SURGERY

HILLIG W. and CUTLER A. J. *Practical Sea Sick as in Aircraft* 1945

Experiment on the prevention of sick seas in aircraft in the Pacific during the war. The results of the experiments conducted in the aircraft during the war are given in the following tables.

All experiments were conducted in the aircraft during the war. The results of the experiments are given in the following tables.

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W. L. J. C. P. G. *Effect of Underwater Pressure on the Human Body* 1945

The effect of underwater pressure on the human body is discussed in this book. The results of the experiments are given in the following tables.

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A third use is to provide a spare piece of skin in case the graft partially fails. Fortunately such partial failures are rare but losses are occasionally incurred from time to time from the presence of hematoma formation.

The graft is folded with its raw surfaces opposed as far as its shape allows. It is then wrapped in a piece of tulle grass and this in turn in a piece of gauze tightly run out of normal saline solution. It is then put in a sterile airtight screw topped glass bottle having a cubic capacity of one cc. It is held away from the small amount of fluid which collects in the bottle by inserting a ring of rubber tubing or lead foil for it to rest on. If this is not done the submerged part becomes edematous. The graft is stored in a household refrigerator which maintains a temperature between 3-16°C. Lowering the temperature slows down the catalytic action of the tissue enzymes and the destructive power of the microorganisms. By lowering the temperature the rate of metabolism of the cells is reduced so that they pass from a state of normal active life into a state of latency or suspended life.

A refrigerated graft is indistinguishable from a fresh graft. Its color is normal. Its cut surface is moist and has a normal sheen. Blood left on the cut surface when it was stored is still fluid. The grafts of normal texture and elasticity. A thick graft has the same tendency to curl at its edges as fresh skin. As to the microscopic appearance, the majority of grafts are normal. Occasionally there is slight retraction of the epidermis. Normal cells in the deeper layers of the epidermis. The acuity does not affect the take of the graft. Up to this degree skin has been preserved even months without showing any histological change. Tissue culture has demonstrated the power of growth of the cells of stored skin.

There is a possibility of a hypothermia reflex reaction and an increase in the power of the skin to withstand infection by some organisms.

The use of skin tissue in stitches fits the skin is advocated by the author and some circumstances to obviate the necessity of skin flaps.

There is a list of first grafts listed below.

Strumf M M nd Hodg C C Fro nltum n
Skin Graft A S 945 8-0

Firstly, one can take a split thickness graft preserved in the frozen state from the donor to be used at temperatures from 3-16°C. These grafts are transported to the patient. These grafts are listed in permanent tables. 85 per cent of the patient is thirty for control graft. Fresh skin in the same patient is listed in tables. 85 per cent. The result of graft gives a poor result be affected by the time of storage. The graft is frozen state at least within the permanent list.

A list from the post list of permanent grafts back from the grafts. The present grafts are listed in a table. The grafts are listed in a table.

state allows the operator to obtain at one operation large numbers of grafts which may be employed for transplantation and anastomosis.

LOUIS T BY AS MD

From A W and Woolfou F M: Resurfacing of the Dorsum of the Hand following Burns. A S 945 39

In treating burns of the dorsum of the hand the aims are to restore the hand as completely as possible to its original function, to provide a permanent surface which will withstand ordinary trauma and to furnish a good cosmetic result. A resurfacing procedure with free grafts extensively used by the authors in civilian practice and in the Services has given excellent results. Lesions of the following varieties have been treated:

- a. A surface covered in part or completely with easily traumatized scar epithelium.
- b. A surface covered with burn keloid.
- c. Large granulated areas.
- d. Large granulating areas with exposed tendons.

I prepare granulating surfaces for operation. The wounds are dressed with hypertonic electrolytic hypochlorite solution. For three or four days. Full therapeutic doses of sulfathiazole are started two days before operation and this chemotherapy is continued for seventy-two hours postoperatively.

General anesthesia is used with the patient in the prone position. Since the majority of the patients have bilateral lesions two operating teams work simultaneously. A pneumatic tourniquet is used to afford a bloodless field. In each case the hair is scrubbed with soap and water. The skin is scrubbed with a povidone-iodine solution. The customary aseptic preparation is then applied. In cases with granulated surfaces the field is meticulously scrubbed with a povidone solution. The granulated surface is then cauterized with 6 per cent silver nitrate and the resulting eschar together with the peripheral area of scar epithelium is cut out as a single piece. The clean edges of the scar epithelium are peeled off so as to leave all the raw areas intact. Large blood vessels are ligated with oosee oosee sutures.

Skin is removed with the Padgett dermatome from 0.016 to 0.021 inch thickness. It is then preferably from the back. The graft is sewn with running sutures. Subsequent evaluation of the graft as shown in Figure 1. The pieces all the grafts are right angles to the defect. The grafts are then sutured with the defect. The graft is then sutured with the defect.

In the cases of grafts covered with saline soaked gauze soaked with liquid paraffin and a 100% hypochlorite solution. A careful rimmed fit at the peripheral edges is maintained. The grafts are then sutured. The wound is then covered with a sterile dressing. The grafts are then sutured.

J. Linn. R. J. Operations for Ant. Filulas.
Som. Reaso. f. r. Filulas. for J. S. f. 04
68 123

A review of the records of 50 patients who came to the Mayo Clinic between 1950 and 1959 for more specifically diagnosed cases of the personality and of the total revealed that 43 per cent or 21 of half of them previously had undergone from 1 to 4 operations that had been unnecessary.

The most frequent causes of the failure of operation to eradicate an anal fistula are as follows:
 (1) faulty concept on the origin and cure of the disease (2) confusion in regard to the anatomy (3) confusion in regard to the terminology (4) mistaking a diagnosis (5) failure to cause a rectal continence (6) inadequate postoperative care (7) failure to appreciate the degree of performance in rectal operations in the presence of infectious diarrhea (8) delay in the diagnosis and (9) lack of technical facilities in medical schools.

ANTISEPTIC SURGERY TREATMENT OF WOUNDS AND INFECTIONS

Lam G. R. a d Puppnd hl M The Pyruvic
Acid M thod I B m Sl gb R moral A
S c oas 866

There is general agreement that the process of repair in any type of wound is favored by the early and complete removal of non-viable tissue. This debridement is accomplished mechanically in the contusio lacerans. Although surgical treatment has been applied to burns occasionally, it has been assumed that a chemical method of slough removal would be preferable because of the difficulty in making an early and accurate determination of the areas which will ultimately prove to be the red and grayed out.

In experim t l d r s a ly slo gh g was p o d ced by dress th small th r d tree burn s w th pyru c e u n s t a ch p to plain d p e c t s t a ch p a t t r a g c a n t h j e l l y n d c o t t o n w e t w t h d s t i l e d w a t e r T h n l y c o m m o n s c t t ; t h e s e d e s a g o w a s t h w e t n e s s

It is suggested that the fa- rable si et n slough
 i bt i ed w th pyru ic id pa te due more to
 macerat n than to the cid i t n produced
 bout th ound A dry gangren is thus con e ted
 nt t n

SAMUEL KAY, M.D.

VI Intosh J R, Ison R, H M, Selbi F R
Ridy J P and Others. Acridin Sulfone
amide Compound as Wound Antiseptics. Clin
ical Trial of Flavazol. *La et Lo d.* 045-49

Research has demonstrated that a wide variety of bacteria constitute the flora of infected wounds and that gram-negative bacilli, as opposed to gram-positive cocci, are primarily involved in the pathogenesis of battle wounds. While the gram-negative bacilli are not obviously pathogenic as such, gram-positive cocci are the

e l l a l g a n i f e c i m e r e
 i r C t m e t h a p e u c l a c e s a p p l i
 m e t t e s t e n t h e r a g e d
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 h u l t p e n t o r c o t r o l i n f e c t i o n b l l a g e n t
 o s g a m m a l e n i c i l l i n f e c t i o n a n d a g a i n s t
 t h e p e n i c i l l i n c o c c i a n d e r i a n e l e c t r a w h e r a s
 t h e g r a m n e g a t i v e b a c t e r i a e r i t e t o p e n i c i l l i n
 a d d i t i o n e n d e s t r o y T h e s u l f a n a m i d e l
 l e n e c m e w a t r e s t r i c t e d t h i s r a n g e b u t a e
 p a r t c u l a r f l c t i e l a n t g s e r s t r i c t o
 c o c c a l i n f e c t i o n s

The acidine antipics such as p-oxaline are very active against both *p. g.* cocci and gram negative bacilli. According to the authors gave the acidines a thorough trial in spite of their possible irritant effect on the tissues. They diluted p-oxaline with sulphathiazol thus providing a powder which covered completely the range of bacterial likely to be found in any wound so that a single action could be obtained. The mixture is part crystalline in 99 parts of solid which can be dissolved in all types of wounds and has proved of great value when used against *p. g.* cocci and both the gram positive cocci and the gram negative bacilli. It is the potentest bacilli and perhaps to a less extent the predominant pyocyan. The application of the mixture also all primary sutures in potentially infected wounds and injuries. Thus powder mixture is now being utilized in the English Army and in industry being applied to various first aid measures.

2. If the acid was recently made in the
 compound containing a chemical combination of an
 acid and alkali was introduced. The
 compound has produced a series of bacteri-
 ostatically active drugs which neutralize slightly
 alkaline solution and are less irritant than the
 original components.

Flavazone is a combination of p o f vine nd sull
that i w s hos n fo the apetic tr ls. This
powd r m r can be enhanc d m ls act its
partic ularly ag nst taphylococ by the additi
of pe c l n which is f lly active the per n
fla z e In a solution of about 10,000 f a c l
can be used a n antiseptic ye wash witho t
causing iritat n. This soluti n has low p
f l nd safe th irrat of infected wo n sand
n bladder age. Flavaz le s also w ll t l r t d
by mouth.

Anther mmbc f the series that cld be u d
is a 5 amp n acid e s lath azol e mmo nd whch
is pr ctically as acti e as fa az l and has th ar
antag f be g almost colorles ha slghtly
y flow t nge It is lightly r r i tat g nller
mble than fl azole

In all tests to determine the comparative bacteriostatic power of these compounds, flavazone, sulfathiazole, and pr. flav. were made. Tests show that the new compounds lose some of the bacteriostatic power of the compounds in the tests.

has to be cut. An 18 gauge needle is used and the amount of opaque material injected is ally varies between 1 and 15 c.c.

The x-ray procedure is quite simple. The authors prefer stable well calibrated heavy-duty equipment rather than light mobile apparatus which can be wheeled into the operating room. For exact positioning and duplication of particular projections they use a bread table of the type described at the University of Chicago. Split second exposures are not as satisfactory as exposures up to 15 seconds but not longer.

The contrast which is 25 per cent thorium dioxide colloidal suspension was found to be the best contrast medium in depth of its undoubted property of long half-life radiactivity. There has been no fatality in the series attributable to the procedure. In 3 per cent of the cases there is untoward effects such as transient hemiparesis, hemiparesis, aphasia, and convulsions. Manifestations were noted. Complications are extreme arterial hypertension, advanced arteriosclerosis and hemorrhage, and thrombosis or embolism of the cerebral vessels.

Intracranial angiography should be used with discretion after preliminary localization of the lesion. The carotid injection serves a good purpose in the supratentorial lesions whereas the vertebral injection is of greater value if the lesions are in the posterior fossa. T. LUCENA, M.D.

J. H. L. Evaluation of Roentgen Therapy in Filariasis. *Am J Roent* 945 53 453.

Filariasis in the present military conflict has become a disease that has challenged the ingenuity of the doctor. The author evaluates the results of roentgen therapy in a group of patients afflicted with filariasis with those in the other group of patients who were not treated with roentgen therapy.

From seven to nine months after arrival in the South Pacific Islands military personnel afflicted with filariasis with the disease starts as a lymphadenitis then continues as retrograde lymphangitis, cutaneous manifestations are noted. The symptoms are fever, headache, aorexia, mental sluggishness, nervousness, fatigue, bulimia, and pain in the area of lymphatic pathology. The lesions are caused by the wuchereria bancrofti. Positive blood smears are rare. The organism may be found in the lymph nodes. Man serves as a host and 45 per cent of the smears are intermedial hosts.

The evaluation of the therapy is difficult because of sporadic remissions and exacerbations. Reports of the literature are too conclusively as to the value of roentgen therapy. A result of two groups of patients each were selected for treatment. One was treated with radiation and the other with control. The group with radiation actually received more roentgen therapy than the control group. The control group had no knowledge of not having received therapy. The group receiving roentgen therapy had the same treatment as

given locally and in some instances whole-body irradiation was used. The technique was 150 kV, 15 mA, 5 cm tube-skin distance, 0.5 mm of copper plus 1 mm of aluminum filtration, 10 to 15 cm half-value roentgens measured in air were given on alternate days for a total dose of 45 roentgens. When whole-body therapy was used, roentgens were given per treatment.

The results were not encouraging. In a follow-up study the results obtained in the irradiated and control groups showed no significant differences in frequency, duration, or severity of the recurrent attacks. In some patients the size of the local glands decreased with roentgen therapy. Local roentgen therapy was more effective than whole-body irradiation. MARCHAND, S. CURRY, M.D.

Rosh, R. and R. L. Radcliffe. Radiological Therapy of Carcinoma of the Thyroid. *Rad* 945 41 559.

The authors publish a series of 64 cases of carcinoma of the thyroid gland; the radiological therapy. The patients of Bellview Hospital, New York, were 18 to 93 years old; the cases encountered in the large thyroid centers such as the Lahey Clinic, the Cleveland Clinic, and the Mayo Clinic. They were the most part far advanced cases which reflect on the final results.

In connection with this series of cases the authors discuss the following aspects of carcinoma of the thyroid: incidence, pathology, metastases, clinical picture, differential diagnosis, treatment, and prognosis.

A study of the incidence would suggest that carcinoma of the thyroid is not a rare disease but is more apparent than real as due to advances in clinical and pathological diagnosis. The proportion of thyroid carcinoma has been estimated at from 1 to 5 per cent. According to the incidence of thyroid carcinoma, the incidence of thyroid carcinoma deaths in the United States. The age incidence varies widely; cases have been observed in early childhood and patients in the twenties. The average age is about fifty years. There are few cases among females than in males but a greater proportion of males.

The histological classification is based on the histological nature of the tumor. The simplest is that of metastatic carcinoma of the thyroid gland. The second is that of primary carcinoma of the thyroid gland. The third is that of primary carcinoma of the thyroid gland. The fourth is that of primary carcinoma of the thyroid gland. The fifth is that of primary carcinoma of the thyroid gland. The sixth is that of primary carcinoma of the thyroid gland. The seventh is that of primary carcinoma of the thyroid gland. The eighth is that of primary carcinoma of the thyroid gland. The ninth is that of primary carcinoma of the thyroid gland. The tenth is that of primary carcinoma of the thyroid gland. The eleventh is that of primary carcinoma of the thyroid gland. The twelfth is that of primary carcinoma of the thyroid gland. The thirteenth is that of primary carcinoma of the thyroid gland. The fourteenth is that of primary carcinoma of the thyroid gland. 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The ninety-ninth is that of primary carcinoma of the thyroid gland. The one hundredth is that of primary carcinoma of the thyroid gland.

the patient every six hours in regard to substernal distress especially following deep breathing or removal of the mask if not contraindicated clinically a careful vital capacity determination should be made twice daily to detect the appearance of pulmonary congestion.

What response to the third group (de-nitrogenation) the ears rarely need for prolonged breathing of 100 per cent oxygen. Since nitrogen is eliminated from the body within several hours, further inhalation of 100 per cent oxygen to remove nitrogen and eliminate nitrogen should not be necessary unless the patient swallows air on removal of the mask.

DR. ALEX BARON M.D.

GENERAL BACTERIAL, PROTOZOAN AND PARASITIC INFECTIONS

Dobson L. and Cutting W. C. F. Iellin and
Sulf namides in Acti omycosis J Am M
A 045 128 856

The present report describes 16 cases of various types of actinomycosis—3 pulmonary, 2 abdominal, and 1 of the cervicofacial type—which were treated with a life ampicillin or penicillin.

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bacteria. The first case of the fungus
was a first case of the fungus.

remaining 3 cases the exact species was not identified.

Of the 16 patients treated 7 were cured in 7 days the disease was arrested and 2 patients died. When the dosage was adequate prompt improvement followed in each instance. With the exception of the 2 fatal cases all of the patients remained cured or the process was arrested for a considerable period of time. Of the 2 fatal cases 1 had revealed a tenacious pulmonary involvement and 1 a showy improvement with each short course of sulfadiazine but treatment was not continued long enough on any occasion to be effective. The other case with cutaneous liver and peritoneal abscesses had responded to sulfathiazole and the process was arrested for several months after discontinuance of the drug. However the short course again in the terminal stage of illness was ineffectual.

A survey of the cervicofacial cases showed that in 9 of 11 patients there had been no dental infection. In 6 the tract preceded the appearance of the infection whereas in 3 the tract was not done until after the infection had started. In 3 remaining cases pus was draining from a deciduous or molar tooth. The thorax believed that these cases support the doctrine of the cystic fistula which suggests that the pathogenic organism may or may not be constantly present in the mouth and in the alimentary canal rather than the embryonic theory which suggests that the infection germs are taken into the mouth accidentally and at once penetrate into the tissues. Most of the occupations and mode of life of the patients without any exception (a nine-year-old and a girl) were most such that frequent contact with the telephone or the press was possible. One father emphasized that these workers in the study of these cases was that where a boy in a moment appears a girl period (it is a two cases).

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MTH J r MD

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The three report cases are as follows:
The first case is related with the
the philosophy of the case.

patients were operated upon before the introduction of Lugol's solution as a preoperative preparation. Of the patients studied 62.1 per cent had a basal metabolic rate of over plus 50 per cent on admission to the hospital before 1917. Twenty-one per cent of the patients after 1939 had a basal metabolic rate of plus 5 or more. These findings suggest that the ophthalmic goiter today even in view of the effect of iodine is not as severe as formerly.

Of the 1016 patients studied 16 died postoperatively. Three other patients died of hemorrhage or hyperthyroidism before returning for their first, second or third operation. Eight others who had persistent or recurrent hyperthyroidism did not die ten years but it was not known definitely whether the hyperthyroidism contributed to their death.

The authors state that the distinction between persistent and recurrent hyperthyroidism is difficult at times. For purposes of classification however a patient who shows persistent toxicity three months after operation has been considered to have persistent hyperthyroidism. Patients who had a normal metabolic rate at the end of three months and who showed no clinical signs of hyperthyroidism were then considered as recurrent cases of hyperthyroidism as found subsequently. Before 1917 it was the practice of the authors to prescribe 10 drops of Lugol's solution once a day for the first three postoperative months.

The relationship of the amount of thyroid tissue removed to the subsequent metabolic rate is demonstrated by the authors. If a thyroidectomy decreases the average metabolism approximately one half at least for a period of six weeks to two months thereafter total ablation of the thyroid produces myxedema.

The basal metabolic rate obtained at three months has some bearing on the time of recurrence of hyperthyroidism especially on the low metabolic group. Those patients who had a metabolic rate of below 10 per cent developed the rate either because a little too radical procedure was carried out or because the activity of the thyroid tissue left behind was normal or subnormal. Thus before thyroidectomy can be predicted in cases of the normal adult a great length of time will be necessary to see if a clinical hyperthyroidism or other things being equal. Recurrent hyperthyroidism did not develop in any of the 8 cases with a metabolic rate of 25 or below. This is not always true because occasionally individuals who have developed postoperative myxedema subsequently although not for a period exceeding one or even two years showed recurrent hyperthyroidism.

The greater percentage of recurrence of persistence occurred in patients with the highest metabolic rates. This would indicate that the underlying cause of hyperthyroidism is persistent growth rather than the average development of the thyroid gland. It probably does not represent the cause of the tendency to develop the recurrence of great

The authors state that it has been their policy to give patients with persistent or recurrent hyperthyroidism a trial of Lugol's solution if the patient severely so. This diminishes the output of the thyroid hormone and in many instances brings the metabolic rate to normal. In spite of the fact that some people continue to be thyrotoxic and then subtotal thyroidectomy is advised by the authors. In other cases iodine controlled the condition for only a variable period of time until clinical toxicity finally appeared suggesting an intensification of the underlying cause.

For those patients in whom reoperation was not considered advisable and iodine did not completely control the symptoms roentgen therapy was used. More recently thoracic has been used in recurrent or persistent cases with the exception of those not under the direct observation of the authors. Improvement in well-being of the patient was noted when a thiouracil was substituted for the Lugol's solution.

There is a small group of individuals who continue to develop hyperthyroidism even though temporarily controlled by surgical removal of iodine or x-rays. In these it would seem necessary to produce myxedema in order to prevent a recurrence. Roentgen treatment has not been permanently successful unless at least from 12 to 18 treatments of 300 roentgens each have been used and in some instances a recurrence has taken place. In the high patients had a moderate result.

In conclusion the authors note that in 589 patients followed up the results were considered excellent in 386 good 139 fair in 38 and poor in 26 to the end of the follow up.

HERBERT T. TAYLOR, M.D.

SURGICAL PATHOLOGY AND DIAGNOSIS

WILLIAM J. S. and RICHARD J. A. T. Pathology 1
of Internal Pathology. G. L. Lee and Co. 1945. 4
395.

A study of 241 colons at autopsy at the May Clinic during the period between October 1942 and February 1943 was made as follows:

Each colon was fixed in a modified Kaiserling's but a few days and studied by means of a hand lens. Those which appeared to be abnormal were taken and placed in a petri dish in which sections were cut in several places. The sections were dried into the following groups:

Those in which no abnormalities were seen though grossly increased in size were labeled as normal.

1. Irregular contour, section showing adjacent intestinal polyps found in the colon.
2. Section showing grossly dilated tubular and malignant growth.

Any structural protrusion in abnormal findings were shown in the following categories: 1. The gross findings were as follows: a. Lipoma, fibroma, teratoma, carcinoma, lymphoma.

phangiomas lipomas and other benign tumors were excluded. No cases of congenital polyps were included. Tissues of newborn infants and of twenty-year-old patients were included.

Polyps were found in 69 per cent of the cases which is a much higher incidence than that noted in other reports the range being from 2.37 to 6 per cent of all cases also the incidence of lesions seemed to be the same in both males and females. Solitary growths occurred in 21 per cent of the cases with malignant polyps multiple growths (from 2 to 6) in 63 per cent and disseminated growths in the remaining 16 per cent. Fifty-seven per cent of the malignant polyps and 91 per cent of the benign polyps were sessile. In the cases with benign polyps the incidence of solitary growths was greater.

In these studies it was possible to trace the pathogenesis of intestinal polyps from the earliest epithelial change to frank carcinoma and it is therefore believed that polyps are a modified epithelial change. The etiological factors are unknown. Lymphoid structures seemed to play only a casual role in the pathogenesis of intestinal polyps and occurred in from 13 to 17 per cent of the cases of polyposis in this series.

The polyps presented a gradual series of changes as follows:

First, all of the polyps showed thickening of the mucosa because of elongation of the crypts (Leube-Kuehn). The degree of ramification seemed to be related to the degree of malignancy. These changes did not extend from the mucosal mucosa but occurred as branching in 6 per cent of the malignant polyps.

Second, the cellular character changed progressively from that of normal control through that of benign to that of malignant polyps. The cells became more irregular, increased in height and gradually became cuboidal type cells. These cells became piled in layers in a disordered fashion and cell nuclei showing mitoses became more frequent. The cell nucleus normally is in position of close approximation to the basal-cell membrane but as malignant changes occurred the nuclear polarity was lost and the nucleus floated distal from the basement membrane. The chromatin content increased in many cells and the shapes of the cells became more anaplastic and bizarre in character as malignancy developed. In malignant changes the basement membrane is lost and displacement of the glandular cells into the subepithelial tissues was seen. The more marked changes of malignancy were seen on the luminal surface.

Third, the production of mucus decreased in similar fashion as correlated by Galanthas mucin stain as well as by hematoxylin-eosin methods.

Fourth, the ability of the cells to bleed after staining properties was increased.

The process of polyp formation commences with an epithelial proliferation as hyperplasia with normal physical and physicochemical functions and to end as a controlled disorderly growth exhibiting

1. gloss of physicochemical function and loss of normal physical appearance. J. P. BARTLEY, M.D.

Stout A. P. Gastric Mucosal Atrophy and Carcinoma of the Stomach. *Ann. Surg.* 1943; 45: 973.

There are two opposing schools of thought as to the relationship of chronic gastritis especially what is usually called chronic atrophic gastritis to carcinoma of the stomach. While some authors have come to the conclusion that chronic gastritis is a definite precancerous lesion others maintain that there is no evidence to suggest a causal relationship other than that chronic atrophic gastritis may be caused or intensified by the presence of carcinoma in the stomach.

In the laboratory of surgical pathology at Columbia University New York, N. Y., the authors studied multiple sections from 150 stomachs—50 with gastric carcinoma, 5 with gastric ulcer and 50 with out gastric ulcer or carcinoma which were removed because of duodenal ulcer. It seemed with white to study this material to see if a further differentiation could be elicited which would be of value in deciding whether or not morphological changes in the gastric mucosa could be regarded as precancerous. These histological features were selected for special study. These were: (1) the transformation of the gastric mucosa into a mucosa of the intestinal type which is commonly called intestinal metaplasia; (2) the character of the gastric glands with the chief and parietal cells; the development of the atrophic and the replacement by a mucosal pattern characteristic of the pylorus and antrum which is referred to as the pyloric and antral metaplasia; (3) the development of the mucosa of the fundus and (4) the development of the mucosa of the colon.

The results of the study confirm the findings of others that mucosal atrophy may appear as early as the third decade and is found with increasing frequency and extent in the succeeding decades of life. Moreover, a comparable group of stomachs mucosal atrophy is found in larger number and tends to be more widespread than is with carcinoma than in those with ulcer. However, when one tries to find actual progression from altered mucosal glands to the type of gastritis or the intestinal type of gastritis or to distorted or irregular it is realized that it is impossible to tell when there is juxtaposition of the carcinoma and the mucosal glands whether the carcinoma is invading the gland or developing from the epithelial cells. Further, it can be stated that in some stomachs with carcinomas in multiple sections from various areas fail to show any pathological changes at fundus.

It would seem therefore that while the physiology of the gastric mucosal epithelium and cyst formation represent a greater degree of disorganization in the stomach with carcinoma than in the comparable stomachs without carcinoma the exact relationship between these two conditions remains determined.

JOSEPH K. A. R. M.D.

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EXPERIMENTAL SURGERY

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